



Faculty of Sciences
Department of Computer Science and Information Systems

The Influence of National Innovation System Structural Factors on eCommerce Adoption by SMEs in Botswana

by

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Bachelor of Information Systems and Data Management (University of Botswana)

A Thesis Submitted to the Faculty of Sciences in Partial Fulfilment of the Requirements for the
Award of the Degree of Master of Science in Information Systems of BIUST

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July 2022

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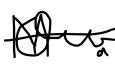
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ABSTRACT

The potential role of eCommerce to safely meet the needs of consumers and businesses during the covid-19 pandemic heightened the need for eCommerce adoption. However, due to their failure and inability to appropriately develop, adopt, and use technology, developing countries have failed to reap the full benefits of eCommerce. Previous studies focused on contextual factors affecting eCommerce adoption. This thesis advances a more comprehensive and holistic understanding of eCommerce adoption factors by establishing the structural factors policymakers can derive from innovation systems when designing eCommerce policies.

We map eCommerce adoption by reviewing the horizontal knowledge transfer practices among networks of SMEs, and vertically with larger businesses, academic research institutions, and public research organizations to highlight the role of knowledge on eCommerce adoption. The study follows the interpretivism philosophy to investigate national innovation system factors as motivators and antecedents of eCommerce adoption. A quantitative research approach was used, where eCommerce adoption by SMEs was treated as a variable that can be measured using a questionnaire. The questionnaire was deployed through three waves using mail, online, and face-to-face survey methods. The data used in this study were collected from 569 SMEs across seven locales in Botswana. Through exploratory factor analysis and structural equation modelling, this study found that knowledge institutions, human capital, ICT infrastructure, and market sophistication influence eCommerce eReadiness. The study found the networks among innovation institutions, and the knowledge flows between them are a critical success factor for eCommerce adoption by Botswana SMEs. Overall, this paper provides a new empirical assessment of innovation system structural factors as antecedents and motivating conditions of eCommerce adoption, and whether policymakers should consider them when developing eCommerce policies.

Keywords: eCommerce, SMEs, developing countries, national innovation systems

ACKNOWLEDGEMENTS

This MSc thesis is the output of several people I am extremely grateful to. First and foremost, I would like to express my sincere and deepest gratitude to my thesis supervisor, Dr Malatsi Galani. Thank you for your responsiveness that brought me to BIUST, and for inspiring and guiding my way through this precarious academic journey. I have learned so much from you. It has been a privilege to work with you, and I hope to work with you again in future.

I would also like to extend my gratitude to my co-supervisor, Prof. William Tibben for spending time to read this thesis and providing useful insights and suggestions. Many thanks for your warm support. Your advice was of great help. Thank you for your substantial contribution to uplifting the studies presented in this thesis.

I would like to express my sincere gratitude to the staff and colleagues of the Department of Computer Science and Information Systems at BIUST for supporting me through this MSc journey by availing of their resources and expertise. Special thanks to my fellow postgraduate students who provided me with a friendly and inspiring environment to work in. I wish you all the best. Bonani Thela, many thanks for your constant support since the beginning of this journey. It was a great pleasure to share the office with you. Randine Tjiriange, thank you for your support and assistance. Keep up with your great work.

I am eternally grateful to all the SMEs for their active participation in the research presented herein. This thesis would not have been possible without you. I would also like to thank Marang Mbaakanyi, Oabile Boitshoko, Magdeline Chilalu, and Kgosiame Bafithile for their huge effort to support me in the data collection for this research. My sincerest gratitude to BIUST for allocating me a research grant, without which the data collection for this study would not have been possible.

I owe immense appreciation to my family members, for their financial support and encouragement throughout this journey. You gave me hope and strength to continue with the hard work. I could not have completed this journey without your constant support, “ndo boka ku singa pele.” Finally, thanks to my friends, for cheering me on through this process, your texts and phone calls went a long way. It takes a village.

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LIST OF ABBREVIATIONS

ECommerce	Electronic Commerce
SMEs	Small and Medium Enterprises
PERM	Perceived eReadiness Model
POER	Perceived Organizational eReadiness
PEER	Perceive External eReadiness
NIS	National Innovation System
OECD	Organization for Economic Cooperation and Development
BIDPA	Botswana Institute for Development Policy Analysis
WEF	World Economic Forum
NRI	Networked Readiness Index
ICT	Information Communication Technology
eReadiness	Electronic Readiness
ISPs	Internet Service Providers
EFT	Electronic Fund Transfer
EDI	Electronic Data Interchange
UNCTAD	United Nations Conferences on Trade and Development
WTO	World Trade Organization
UN	United Nations
GDP	Gross Domestic Product
TAM	Technology Acceptance Model
TOE	Technology Organization Environment Framework
DOI	Diffusion of Innovation Theory
B2B	Business-to-business eCommerce

CHAPTER 1: INTRODUCTION

1.1. Introduction

Small and medium enterprises (SMEs) in Botswana struggle to survive and are prone to high failure rates (Guruwo and Segolame, 2018). This can be attributed to their small size and limited resources. The limited capacity of SMEs is exacerbated by challenges such as restricted access to finance, complex and lengthy bureaucratic processes in setting up, operating, and sustaining eCommerce enterprises, poor infrastructure, and the lack of effective institutional structures in developing countries (Chandra, 2012; Ejiaku, 2014; Esmaeilpour, Hoseini and Jafarpour, 2016; Oliveira and Martins, 2010). The growth and development of information communication technology (ICT) have exacerbated the pressures on developing countries' domestic markets from foreign competition (OECD, 2017).

eCommerce presents SMEs with an opportunity for sustainable growth and development by expanding their market size, reducing their operational costs, and improving the efficiency of their business processes, leading to increased profit margins (M.Sadeeq *et al.*, 2020). As a result of the widespread use of ICT and the proliferation of the internet, electronic commerce (eCommerce) has become an integral part of conducting business in the modern economy (Alyoubi and Ph, 2015). Enterprises that do not adopt eCommerce will likely eventually struggle to exist as technology continues to evolve and proliferate (OECD, 1999). Thus, all businesses, including traditional brick-and-mortar enterprises must establish an internet presence to remain competitive.

However, due to their characteristic limited resources, a large majority of SMEs in developing countries have focused on traditional industries whose activities are mostly characterized by low technology usage and an unskilled labour force (World Bank and Proofs, 2001). According to the World Trade Organisation (WTO, 2016), SMEs are disproportionately affected by the challenges to technology diffusion and adoption. Chandra (2012) agrees that due to their failure and inability to appropriately develop, adopt, and use technology, SMEs have been unable to reap the benefits of the global economy.

1.2. Problem Statement

SMEs remain the cornerstone of Botswana's economy and are key to the sustainable and inclusive economic growth of the country. They account for over 80% of employment and contribute over 20% to the GDP (UNCTAD, 2021). Botswana's SMEs are increasingly looking to grow their businesses both locally and internationally to expand their market reach. However, the effects of the economic slowdown caused by the covid-19 pandemic, rising inflation resulting from the Ukraine war, threats

of persistent drought, and the adverse effect of poor economic conditions in South Africa on Botswana's exports pose as challenges to the development of SMEs.

According to Parkey (2012), eCommerce adoption by SMEs is a critical success factor for the overall technological advancement of a country. eCommerce offers countries with small populations such as Botswana opportunities to tap into larger markets and promote exports (UNCTAD, 2021). The potential role of eCommerce to safely meet the needs of consumers and businesses during the covid-19 pandemic compounded the need for businesses to have an online presence (OECD, 2020b). Amid the slowing economic activity, the pandemic led to accelerated digital transformation, including a surge in eCommerce (Zou and Cheshmehzangi, 2022). However, the pandemic also highlighted digital divides, exposing the need for greater efforts to reduce inequalities in eCommerce adoption (OECD, 2020a).

Although preliminary data from eCommerce companies indicates growth in eCommerce activities in response to the pandemic, eCommerce adoption in developing countries is still lagging (Ibrahim, Turyakira and Katumba, 2019; UNCTAD, 2022). Similarly, eCommerce adoption is still low in Botswana, with only 5% of internet users making online purchases (UNCTAD, 2021). Understanding factors that influence SMEs to adopt and use eCommerce technologies may help managers, policymakers, and other innovation actors establish systematic implementation and maintenance strategies for eCommerce (Zygiaris, 2021). Pavlou and Fygenson (2006) agree that understanding and predicting how users receive technology is a critical success factor to consider toward eCommerce adoption.

Although eCommerce adoption factors have been extensively studied, previous studies have predominantly focused on contextual factors. There is a consensus among researchers and policymakers recognizing the national innovation system (NIS) approach as an ideal conceptual framework for analysing technological uptake (Bartels et al., 2012; Attia, 2018). According to Zygiaris (2021), there is a lack of research on the impact of innovation systems on eCommerce capacity. Filling this knowledge gap can provide evidence to encourage investment in innovative eCommerce technology, and skills, and the establishment of support institutions to promote eCommerce adoption by SMEs. The work presented in this thesis is intended to provide this information.

1.3. Research Objective

The main objective of the study was to identify the national innovation system structural factors that influence Botswana SMEs to adopt eCommerce, and how to optimise those factors that facilitate SME use of eCommerce technology.

1.4. Research Questions

The following research question was formulated to achieve the research aim:

What national innovation system structural factors influence SMEs in Botswana to adopt eCommerce?

The following sub-questions were formulated to cover the different national innovation system structural factors that influence eCommerce adoption to provide a comprehensive and holistic answer to the research question:

1. What institutional factors influence Botswana SMEs to adopt eCommerce?
2. What human capital factors influence Botswana SMEs to adopt eCommerce?
3. What ICT infrastructure-related factors influence eCommerce adoption by Botswana SMEs?
4. What market sophistication factors influence eCommerce adoption by Botswana SMEs?
5. What knowledge factors affect eCommerce adoption by SMEs in Botswana?

1.5. Scope of the Study

The research questions were addressed by extending the Perceived eReadiness Model (PERM) developed by Molla and Licker (2005) with a set of new variables grounded in the national innovation systems approach as informed by the literature review. The study explores how national innovation systems can be used to counter eCommerce adoption deterrent factors and optimize motivating factors to develop the eReadiness of Botswana SMEs for eCommerce adoption. The hypotheses in the model were tested using a quantitative approach where a questionnaire survey was deployed across seven locales in Botswana. Botswana was selected due to the researcher's expert knowledge of Botswana eCommerce and access to the survey population of Botswana SMEs. Similar to other developing countries, Botswana faces the problem of low eCommerce adoption among SMEs. Statistical analysis was conducted on the data collected to test the relationships between the different variables of the research model.

1.6 Operational Definition of Key Terms

eCommerce

eCommerce in this study refers to a business model in which transactions such as the buying, selling, transfer, and exchange of goods and services take place over the internet.

eCommerce adoption

eCommerce adoption in this study is measured by whether a business has a website, whether its customers can buy goods and services from them online, and whether their system is integrated with suppliers and customers.

NIS

The national innovation system in this study was used to refer to how the interaction of knowledge institutions and SMEs.

NIS structural factors

The NIS structural factors in this study were used to refer to the aspects and characteristics of NIS that influence eCommerce adoption by Botswana SMEs.

SMEs

SMEs in this study was used to refer to those entities employing less than 25 employees, making annual profits of between P60 000 and P1 500 000, while medium enterprises have between 25 to 100 employees and annual revenue of between P1.5 million and P5 million as defined by BIDPA (1998).

1.7 Structure of the Thesis

This thesis is organized into seven chapters. Following this introductory chapter is a review of the literature on the research problem and the key issues relating to the research questions. Chapter 2 exposes the research gap and provides a rationale for this study. Chapter 3 describes the development of the research model. Chapter 4 discusses the methods, techniques, and tools used to answer the research questions and meet the research objective. Chapter 5 describes the process followed to analyze the data to test the research model and reports the findings from the research hypotheses testing. Chapter 6 presents a discussion of the research results. Finally, Chapter 7 presents the research conclusion. The contributions of the study are covered in this chapter and the limitations of the study and recommendations are provided.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This chapter describes the context of the study and provides a review of the existing literature to develop a better understanding of the factors that influence eCommerce adoption by SMEs in Botswana. This chapter relates the current study to the existing body of eCommerce literature and reveals the research gap that justifies the study.

2.2. Study Context

This study was conducted in Botswana. Botswana is a landlocked located in Southern Africa sharing borders with Namibia, South Africa, Zimbabwe, and Zambia and occupying a land mass of 581,730 square kilometres. The latest census recorded a population of 2 346 179 (Statistics Botswana, 2022).

2.2.1. Political context

Botswana has boasted a stable political environment since gaining independence from British colonial rule in 1966 (African Economic Outlook, 2018). Botswana has a multi-party democratic tradition, with elections held every five years. Botswana held its eleventh general election on October 2019. The Botswana Democratic Party, which has been in power since independence won the elections with President Mokgweetsi Eric Masisi assuming pthe residency.

2.2.2. Economic Overview

Botswana had one of the weakest economies in the world at independence. The World Bank currently classifies Botswana as one of the world's fastest-growing economies. Significant mineral (diamonds) wealth, good governance, prudent economic management, and a small population have made Botswana an upper-middle-income country. However, despite having maintained political and economic stability over the years, challenges remain. An over-reliance on the diamond and public sector makes Botswana's economy vulnerable to external pressure. The covid-19 pandemic exasperated the vulnerability of the economy, resulting in an 8.7% contraction by 2020 as fiscal pressures rose (World Bank, 2022).

Despite being categorized as an upper middle-income country, Botswana still shares many characteristics with developing countries. Inequality in Botswana remains one of the highest in the world with job creation lags and a high unemployment rate of 26% at the end of 2021. Accelerating reforms to the business environment and providing effective support for entrepreneurship can contribute to the diversification of Botswana's economy.

2.2.3. SMEs in Botswana

Botswana Institute for Development Policy Analysis (BIDPA, 1998) defines SMEs in Botswana as enterprises employing less than 25 employees, making annual profits of between P60 000 and P1 500 000, while medium enterprises have between 25 to 100 employees and annual revenue of between P1.5 million and P5 million.

Botswana SMEs are characterized by low-profit margins resulting from the low purchasing power of customers and many competitors (Nkwe, 2012). SMEs in Botswana are generally categorized under the informal sector, which is made up of many different types of businesses that share unstructured features (Mwobobia, 2012). Most formal SMEs evolved from the informal sector. There is generally low equity between SMEs and large enterprises in Botswana due to the limited resources of SMEs that inhibit them from expanding their businesses (Mutoko, 2014). These characteristics hinder the healthy relationships between SMEs and banks. As a result, SME managers must rely on their owners' resources and expertise to build and grow their businesses.

According to the Local Enterprise Authority (LEA), an organization established to carry out the mandate of entrepreneurship and enterprise development in Botswana, SMEs account for 90% of Botswana businesses (LEA, 2007). Thus, SMEs are central to the efforts to achieve sustainable development in Botswana by supporting sustainable and inclusive economic growth, providing employment, promoting sustainable industrialization, and reducing income disparities (Mutoko, 2014; Olatokun & Kebonye, 2010). However, Botswana SMEs have struggled to diversify and expand their market beyond the government which is currently their major target market. This has led to alarmingly high rates of SMEs' failure with BIDPA (2018) reporting an 80% failure rate of SMEs in Botswana, with 70% closing within the first eighteen months.

eCommerce provides an opportunity for SMEs to revolutionize and grow their businesses. The growth of the digital economy, including eCommerce, needs to include and benefit Botswana SMEs which represent a significant sector for driving Botswana's economic diversification and sustainable growth plan. However, SMEs in Botswana are faced with challenges that inhibit their eReadiness for eCommerce adoption (Uzoka, 2007; Mwobobia, 2012; Lusenge, 2014).

2.2.4. eReadiness

The success of initial eCommerce initiatives depends on a strong foundation of eReadiness (Idikat, 2004). eReadiness is generally determined by the ability of an organization to successfully adopt, use, and exploit the benefits of ICTs (Ruikar, Anumba and Carrillo, 2006; Ali & Alrayes, 2014). It is an

important concept for facilitating the assessment of the potential of businesses for eCommerce uptake. According to the World Economic Forum, Botswana's networked readiness index (NRI) ranking has fluctuated substantially through the years. Botswana's NRI was recorded at 3.4 (on a five-point scale) in 2015, earning the country 104th place globally (WEF, 2015). A high literacy rate of 87.7% can strengthen Botswana's eReadiness for eCommerce (UNESCO, 2015). The high literacy rate ensures that citizens can communicate in English over the internet and have the technical skills to navigate the online world. Thus, the UNCTAD (2021) considers Botswana as the ideal location for leveraging regional eCommerce growth.

However, eCommerce adoption remains low. Measures are needed to improve eReadiness to develop capacity for eCommerce uptake. Governments have a significant role to play in capacitating SMEs for eCommerce adoption through the formulation and implementation of policies and regulations, structural support, funding, and providing infrastructure (Tan, Tyler, and Manica, 2007).

2.2.5. eCommerce Policy

Botswana has a well-developed legal and regulatory environment governing electronic payments (UNCTAD, 2021). An important aspect of developing eReadiness for eCommerce adoption in the country is its robust ICT laws and recently updated regulations. Botswana's National ICT Policy (Maitlamo) was first introduced in 2004 to facilitate the development of a conducive environment for the development of the ICT industry for Botswana to become a regional ICT hub. Maitlamo (2004) aims to guide ICT initiatives by establishing general access to information, developing an ICT regulatory framework, and improving government services. With the support of the UNCTAD (2021), Botswana launched the National ICT Policy Review and eCommerce Strategy that centres on eCommerce and the digital economy in efforts to grow businesses and drive Covid-19 recovery. Botswana recognizes eCommerce as a distribution channel providing access to international markets, boosting the productive capacity of developing countries, and facilitating integration into global value and supply chains. However, according to the International Trade Centre (2019), the rate of eCommerce adoption in Botswana remains low, mostly by financial institutions and foreign-based companies.

The rise in application innovations and mobile e-marketplaces has contributed to the growth of mobile commerce. Various government technology initiatives such as the use of electronic platforms to obtain government services such as e-procurement and e-tax filing are instrumental in acclimating the population to the online environment (UNCTAD, 2021). Mobile apps for utilities also facilitate

technology innovation. However, users represent a small segment of the population. According to UNCTAD (2021), 36.7% of Botswana's population was using the internet in 2018, with only 5% engaging in online transactions.

2.3. eCommerce

Zwass (1996) identifies the electronic transmission of messages during the Berlin airlift in 1948 as the origin of eCommerce. The development of Electronic Data Interchange (EDI) followed, enabling users to exchange business information over private networks and value-added networks (Sirurmath, 2004). According to Tian and Stewart (2008), the high cost of private networks made the EDI system very expensive to run. They explain that as a result, the use of these applications was mostly limited to large corporations. Tian and Stewart (2008) recognize the emergence of the world wide web in the early 1990s was a major milestone in the evolution of eCommerce as it made the internet accessible to consumers.

There are many different definitions of electronic commerce in the literature, indicating a lack of consensus about what electronic commerce is. The following examples provide a representative sample of the varied definitions of eCommerce found in the literature:

“Electronic commerce is the sale or purchase of goods and services conducted over computer-mediated networks, including EDI but excluding intranet transactions” (OECD, 1999).

“Electronic commerce is a business model in which transactions take place over electronic networks, mostly the internet” (Turban *et al.*, 2010).

“E-commerce can be defined as any social transaction made on the internet” (Wigand, 1997).

Holsapple and Singh (2000) assert that the question under investigation determines the appropriate definition of eCommerce to use. In this study, eCommerce refers to any business transactions between SMEs, consumers, competitors, suppliers, government, and any other relevant stakeholders, that are conducted over the internet.

2.3.1. Types of eCommerce

Shafiyah *et al.* (2013) explain that different types of eCommerce are constantly being invented as technology continues to evolve. The types of eCommerce commonly discussed in the literature are business to business (B2B), business-to-consumer (B2C), consumer-to-consumer (C2C), and business-to-government (B2G).

Business-to-business eCommerce (B2B)

B2B describes the electronic transfer of products, services and information between enterprises (Jain and Arya, 2021). B2B enables businesses to maximize productivity while reducing operating costs (OECD, 2004).

Business-to-consumer eCommerce (B2C)

According to Banda (2019), B2C refers to the transactions between online retailers and their customers (Banda, 2019). For example, platforms such as Amazon and AliExpress offer virtual marketplaces where customers can shop directly from international online retailers.

Consumer-to-consumer eCommerce (C2C)

C2C enables consumers to trade goods and services amongst themselves (Shafiyah *et al.*, 2013). Platforms such as eBay allow consumers to display their products and provide a payment platform. This model of eCommerce is particularly useful for individuals operating resale businesses and those interested in selling used items in their houses.

Business to government eCommerce (B2G)

B2G refers to the electronic transaction of products and services between businesses as suppliers and various government departments and institutions as consumers (Nemat, 2011).

2.3.2. Benefits of eCommerce Adoption

2.3.2.1. Benefits of eCommerce to SMEs

The number of internet users continues to grow in Botswana with The World Bank organisation reporting that 61% of the population used the internet at the start of 2022, a 1.9% increase from 2021. It is imperative for business enterprises to similarly transform and innovate their technical capabilities to better serve customers in the digital age (Jovanovic *et al.*, 2020).

Albastroui (2007) recognises eCommerce as the most significant development since the industrial revolution. According to Soto-acosta and Meron (2009), the open structure of the internet and the relatively low cost of using it has led to many innovations that have enabled a powerful information system and revolutionized communication. The way people communicate with one another, share files, make purchases, and collaborate has evolved since the internet became widespread (Bourgeois and Bourgeois, 2014).

eCommerce is rapidly becoming an integral part of conducting business due to its potential to increase sales and productivity by transcending geographic and time boundaries in the global economy (Kumah, 2017). Before the proliferation of the internet, small businesses were limited to

their geographical area (Travica *et al.*, 2014). Although catalogue shopping was an option, it was most feasible for large corporations with the financial resources to take on the expense of mailing catalogues. A lack of resources restricted small businesses from sending salespeople to customers. These factors put SMEs at a significant disadvantage against large enterprises.

eCommerce has enabled SMEs to expand their market reach at relatively low costs (Rokhim, Wulandari and Mayasari, 2018). It eliminates the necessity to acquire expensive shopfronts on high streets thereby reducing business costs. Thus, eCommerce makes it possible for businesses to trade their goods and services online to a wider market at less expense and effort than would be required for traditional brick-and-mortar enterprises (Esmaeilpour, Hoseini, and Jafarpour, 2016). While the initial set up of a good website might be costly, it is comparatively cheaper in the long run than operating from brick-and-mortar storefronts (Al-Hudhaif and Alkubeyyer, 2011). According to Travica *et al.* (2014), companies that operate through the traditional approach and have incurred substantial costs developing physical infrastructure are now having to compete with enterprises based on eCommerce models with much less physical infrastructure. Ash (2020) presents the case of Blockbuster as an example. Blockbuster was a successful international video rental franchise. When Netflix, an eCommerce-based business was established, it claimed a sizable amount of Blockbuster's market share, which ultimately led to its bankruptcy. Another example is Amazon, an online marketplace which seized a substantial market share which led to the closure of many small booksellers. Based on these examples, it is evident that traditional companies will have to adjust to new technologies to survive and thrive in the modern economy.

eCommerce has transformed the way goods are produced and distributed, the way businesses market and sell their products, and consumer buying habits (Khan, 2016). eCommerce is forcing companies to rethink their marketing and sales strategies. According to Panigrahi (2016), the internet has led to innovative ways of marketing and advertising through websites, banner placements, and search engine optimization which enable businesses to reach millions of potential customers anywhere in the world through the web. For instance, social networking sites have allowed businesses to interact with customers on a more personal level through influencer marketing.

Furthermore, eCommerce enables businesses to improve the efficiency of functions such as supplier management, inventory management, and payment management Shafiyah *et al.* (2013). Businesses can process more purchasing orders in less time and at a lesser cost. eCommerce also reduces the occurrence of clerical errors and increases the speed of processing invoices, resulting in lower

transaction fees (Shafiyah et al., 2012). eCommerce helps optimize the inventory process by providing faster data access by linking the businesses with suppliers, distributors, agents, and other stakeholders (Wu, 2021). This linkage also improves the efficiency of managing payments between a business and its partners and distributors (Sergi and Esposito, 2017). Wu (2021) explains that businesses can process more purchasing orders in less time and at a lesser cost. Nwosu (2017) agrees that B2B enables electronic tracking of order shipments which results in improved inventory auditing capabilities. eCommerce businesses can outsource the production of high-quality goods from international suppliers at less expense, thereby gaining an advantage over local companies who seek to do everything from production to supply.

Moreover, information is integral for businesses to devise strategies to position themselves competitively and to identify gaps in the market. The internet is a useful tool for businesses to research new product ideas to meet customer needs, more efficient and innovative production methods, and competitive pricing information (Alyoubi and Ph, 2015). Companies that seek to expand into new locations can easily gain insights into the population, their needs and buying power and patterns through internet research (Dwivedi, Wade and Schneberger, 2012).

Embracing technology speeds up the growth of SMEs up to three times (Ardjouman, 2014). Overall, there is consensus that eCommerce has the potential to enhance the productivity and competitiveness of SMEs in developing countries (Carlos, 2005; Howe, 2015; Molla & Heeks, 2007; Oliveira et al., 2011; Zahid & Din, 2019).

2.3.2.2. Benefits of eCommerce adoption to developing countries

eCommerce has the potential to solve many prevalent issues in developing countries such as lack of infrastructure, lack of financial resources, inadequate regulatory policies, cultural influences, and lack of skilled personnel (Mohamed et al., 2018; OECD, 2017; Olatokun & Kebonye, 2010; Shemi and Procter, 2013). eCommerce has the potential to improve citizen welfare by saving time, providing convenience, and access to a broader range of goods and services which can be finely tuned to individual needs because of artificial intelligence and targeted marketing (Hardilawati, Binangkit and Sandri, 2019). Customers now have more options because they can shop remotely from stores located anywhere across the world (Hajli *et al.*, 2012). Thus, eCommerce expands business competitiveness, giving consumers more price and quality options (Fedorko, Bacik and Gavurova, 2018). This can have a positive impact of the quality of living of citizens of developing countries.

The evolution of ICT and the internet has spurred innovations resulting in new types of businesses. Thus, eCommerce has the potential of diversifying developing countries' economies. eCommerce enables innovative SMEs to tap into niche international markets and to partner with large international enterprises in serving new markets (Tan, Tyler and Manica, 2007). Technological innovation by developing countries' SMEs has the potential to not only improve their profit margins, but also create employment thereby improving the welfare of citizens (Biagi and Falk, 2017; Kumar, 2017).

There is an apparent need to support eCommerce adoption by SMEs in developing countries to aid their growth and maximize profits, thereby contributing more meaningfully to national economic development. Hence, eCommerce adoption can play an important role in the competitiveness and economic stability of developing countries.

2.3.3. Barriers to eCommerce Adoption

The low eCommerce adoption rate in developing countries is symptomatic of the unique contextual issues faced by businesses in their effort to innovate and adopt the technology (Shemi and Procter, 2013).

The low eCommerce adoption rate in developing countries can be attributed to the domination by small enterprises which tend to value personal relationships for business (Wresch and Fraser, 2011; Mohammed and Tejay, 2017). However, eCommerce transactions between corporations and customers require the transfer of personal information over the internet (Ungerer, Molinuevo and Rovo, 2020). As the internet is still a relatively new phenomenon in developing countries, confidence and trust are still low from customers and among businesses (Esmaeilpour, Hoseini, and Jafarpour (2016). The UNCTAD (2015) suggests that lack of trust is one of the main impeding factors of eCommerce adoption in developing countries. Kang *et al.* (2016) agree that lack of confidence in information privacy presents a major limitation for eCommerce adoption in developing countries. Businesses are reluctant to transact online based on their perception of internet safety, their eReadiness concerns, and their degree of interest (Ndayizigamiye and Khoase, 2018; Nwosu, 2017; Khan, 2016).

According to Travica et al. (2014), the lack of legal regulations in developing countries exacerbates the issues and concerns associated with online transactions, and in turn, harms businesses' willingness to engage in eCommerce transactions. A regulatory framework can help address the challenges that arise from online shopping, including scamming, uncertain product quality, risk of

monetary loss and privacy issues (Almousa, 2013). However, due to the relative newness of eCommerce, compounded by the open nature of the internet, the regulatory environment in developing countries is still not adequate to support successful eCommerce adoption (Al-Hudhaif and Alkubeyyer, 2011). Developing countries are behind in establishing laws and policies to regulate online transactions (UNCTAD, 2015). There is an apparent a need to modernizdeveloping countries' governments to be compatible with the digital world and maintain competitiveness in the global market (Hardilawati, Binangkit, and Sandri, 2019; Dobrescu, Faces, and Europe, 2019). Moreover, regulations have a direct impact on the process of innovation and on how the innovation system is organized (Borrás and Edquist ,2014). The initialadoption of eCommerce is facilitated by supportive government policies, an effective legal environment, and compatible socio-cultural infrastructure (Thatcher, 2010). Thus, governments play a crucial role in establishing laws that provide critical support for conducting business online.

Developing countries are also characterized by a lack of ICT infrastructure, which has a significant impact on their readiness for eCommerce (Econ and Conicet, 2019; Ozaki et al., 2011). Inadequate ICT infrastructure deters developing countries from working efficiently and prohibits access to global markets (Esmaeilpour et al., 2016). Internet connectivity, quality, speed, and cost pose major challenges that inhibit eCommerce adoption in developing countries (Ardjouman, 2014). Functional e-payment and banking systems, as well as software services are crucial to the success of eCommerce adoption (Alyoubi and Ph, 2015). While developing countries' banks are upgrading their payment systems to accept electronic payments and employing local software support, the lack of telecommunications infrastructure continues to deter the adoption of eCommerce. Furthermore, developing countries still lack the delivery services and traffic infrastructure that are required for eCommerce to thrive (Alyoubi and Ph, 2015). Shippers are unmotivated to conduct business with developing countries due to unreliable delivery services and lack of technology and strict customs laws (Travica, 2002). Custom delays, high ccustomsduties, delays in shipping goods, and unsteady, fluctuating shipping costs in developing countries deter eCommerce adoption.

Particularly, SMEs in developing countries face challenges in acquiring, adopting, and implementing electronic commerce. SMEs are disproportionately affected by market failures, resource barriers, an inadequate business environment, and a lack of policies (Nazir, 2018; UN/DESA, 2019). As a result, although digitization presents new opportunities for developing countries to participate in the global economy, SMEs are still lagging in technology innovation (Olatokun and Kebonye, 2010; Rahayu

and Day, 2015), an important tool for furthering economic growth and promoting a more equitable globalization (Jia, Tang and Kan, 2020).

Studies in Zimbabwe (Erasmus, 2006), Botswana (Shemi, 2012), Uganda (Ssewanyana & Busler, 2007), and Kenya (Wanjau, Macharia N, and Ayodo Eunice M A, 2012) suggest that the eCommerce model and strategies followed by developed nations are unsustainable for developing countries contexts. Developing countries largely depend on developed countries for ICT. The imported technology often fails to meet the social and cultural expectations of users in developing countries as they lack the skills to adapt them to suit their context (Vatanasakdakul and Tibben, 2004).

Successful eCommerce adoption by SMEs in developing countries depends on the coordinated efforts of various actors beyond the adopter organization (Zygiaris, 2021). Adoption involves the coordination and evolution of a multitude of factors from adopter organizations to decision-makers, technologies, complementary innovations, business partners, professional groups, and universities (Vega and Brown, 2011). This is the concept of an innovation system, based on the idea that successful innovation relies on the coordination of different actors and practices (Nelson, 1993).

2.3.4. eCommerce Adoption in Botswana

The growth of the middle class and social media-savvy youth has resulted in a high number of smartphones and broadband users, positioning Botswana well for eCommerce growth (UNCTAD, 2021). Botswana's proximity to the South African major economic market and its geographical location at the centre of Southern Africa place the country in a favourable position for eCommerce (Botswana Investment & Trade Centre, 2015). Botswana's positioning offers land-linked access to fast-growing markets, presenting an opportunity to expand its market size.

Botswana has the leading landlocked infrastructure in Africa and the third-best environment that is conducive to logistic operations in the region (World Economic Forum, 2015). Botswana has committed significant resources toward the development of new transport infrastructure and to revitalize existing transport corridors such as the Kazungula Bridge Project. These factors afford Botswana eCommerce entrepreneurs the capacity to expand their market base in the region as they can easily transport products to customers. Furthermore, membership to trade unions such as SACU enables Botswana businesses to trade across Southern Africa tax free. The trade agreements made by Botswana also give local eCommerce enterprises access to large developed markets.

However, the high cost of internet connection and low quality of internet services in the country is a barrier to eCommerce adoption (Lusenge, 2014; Mutoko, 2014; Olatokun, 2010). The lack of knowledge, use, and experience of eCommerce is another deterrent to adoption by Botswana SMEs (Shemi and Procter, 2013). The lack of diversification in Botswana's economy and insufficient growth of the private sector have stifled the business sector, limiting the competitiveness of Botswana's eCommerce enterprises (Conteh, 2008).

Full national coverage requires large ICT and logistics investments because of the dispersion of Botswana's population over a large geographical area. eCommerce use in Botswana is hampered by the lack of a domestic switch that processes payment instruments (UNCTAD, 2021). Botswana's landlocked status presents a challenge in the development of eCommerce infrastructure and logistics Faye *et al.* (2004). Furthermore, online shoppers in the country have encountered fraudulent activities such as the non-delivery of products, fraudulent electronic wallet messages, and tax avoidance, making them reluctant to engage in eCommerce activities (UNCTAD, 2021).

2.4. National Innovation System Approach to eCommerce Adoption

The concept of innovation has evolved to include not only developing new products and processes but also adapting and modifying those that have already been developed and used in developed countries (Gronning, 2008). The idea of a network of interactions between innovation actors is a common theme across existing definitions of a national innovation system (NIS).

The idea that technology and information flow between people, firms, and institutions, is crucial to a country's technology innovative process and is the basis of the national innovation system (WTO, 2013). Innovation and technology development result from the networks and interactions among enterprises, universities, government research facilities, and other innovation actors as a collective system of knowledge creation (OECD, 1997). The national innovation system approach can be useful for developing the technology innovation capacity of developing countries, a subset of which is eCommerce adoption (Zygiaris, 2021). There is a consensus among researchers and policymakers recognizing the NIS approach as an ideal conceptual framework for analyzing technological uptake, which is considered to be an integral part of innovation (Bartels *et al.*, 2012; Attia, 2018).

The innovative capacity of a country's industry is a determinant of its competitiveness (United Nations, 2001) and the innovation system approach posits that business organizations are the main innovators in the economy. As SMEs make up most of the business environment in developing countries, they are the main actors in the NIS of developing countries. Thus, SMEs are central to the

overall technological development of developing countries (Parkey, 2012). However, the inadequate resources of developing countries' SMEs and their low capacity to absorb failure hinder them from accessing eCommerce benefits their capacity (Šoltés and Gavurová, 2014).

Substantial resources are required to invest in technological innovations and adopting new technology exposes businesses to the risk that innovative efforts may not yield the expected benefits (Todtling and Kaufmann, 2002). Thus, technological innovation by SMEs depends on the support of institutions specifically focused on the adoption and adaptation of technologies and the diffusion of human, technological, and other capabilities (Chandra, 2012). For a country to be more innovative, understanding the relationships between institutions and how they contribute to the creation, diffusion and use of knowledge is critical (OECD, 1997; Ibikunle, 2013).

Countries following a systematic innovation development strategy have made technological advances and gained a competitive edge (Wilson, Maharaj and Maharaj, 2020). Thus, governments around the world are adopting the NIS approach to replicate the same success (Parkey, 2012). Economists and policymakers continue to recognize that the NIS has the potential to revolutionize developing countries' economies (Intarakumnerd and Goto, 2018). The OECD (1997) which endorses international standards and best practices for economic development policy has endorsed the NIS concept. Zygiaris (2021) established that there is a positive relationship between NIS and national eCommerce capacity. Parkey (2012) similarly suggests that the extent of the eCommerce success achieved by countries like India is largely dependent on the innovation systems that evolved over the years.

According to Wilson, Maharaj, and Maharaj (2020), there is a need for contextual issues to be considered when applying the NIS approach in developing countries. Maloney (2017) explains that the NIS of developing countries cannot just replicate those in developed country contexts but must be relevant to the social and economic conditions of the individual country. Therefore, there is a need to investigate the national innovation structural factors that affect eCommerce adoption in Botswana.

2.5. Theoretical Background

The potential benefits of eCommerce to SMEs in developing countries can only be realized if eCommerce is adopted (Molla and Licker, 2014). Understanding and predicting how users will receive technological innovations are recognized by Pavlou and Fygenson (2006) as an integral part of successful eCommerce adoption. In response, numerous innovation theories, models, and frameworks have been developed to conceptualize eCommerce adoption and the process thereof.

Models have a descriptive purpose by pointing out the factors believed to influence adoption rates (Nilsen, 2015). They act as a checklist of factors relevant to various aspects of adoption and implementation, detailing the various barriers and facilitators. Theoretical models lead to more meaningful and generalizable findings (Dickson, Dickson, Adu-Agyem and Emad Kamil, 2018). Based on this, several models that are prevalent in eCommerce research were considered for this study.

2.5.1. Technology Acceptance Model (TAM)

The TAM is the most commonly applied theoretical framework in information technology research (Alice Phiri Shemi, 2012; Hung *et al.*, 2014; Idris, Edwards and McDonald, 2017; Olushola, Page and Abiola, 2017; Scherer, Siddiq and Tondeur, 2019). The Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) concepts underlie TAM as an information systems theory. Davis (1989) defines Perceived Usefulness as the degree of certainty one has that technology will improve their job performance, while Perceived Ease of Use is described as the perception by prospective users of the intellectual and physical labour required to use the technology. Scherer, Siddiq, and Tondeur (2019) recognise the TAM as a useful model for understanding users' intention to use eCommerce.

Several studies have utilized the TAM in eCommerce adoption research in developing countries. A study by Makame, Kang and Park (2014) found technology infrastructure to be a critical factor in eCommerce adoption in Tanzania, while national policy initiatives are critical towards building online trust and improving technology infrastructure. Abou-Shouk, Lim and Megicks (2016) also conducted a study based on the TAM and found that environmental factors affect how travel agents in Egypt perceive the benefits and barriers of eCommerce adoption and influence their decision to adopt eCommerce with a predictive capacity (r-square) of 0.730. Some studies have extended the TAM to reduce its limitations. Suryawirawan (2021) extends the TAM by adding self-efficacy and anxiety to investigate eCommerce adoption among college students with a predictive capacity of 0.526. Aldammagh, Abdeljawad and Obaid (2021) integrated the TAM and the Theory of Planned Behaviour (TPB) to investigate the factors that influence the acceptance of mobile banking applications in Palestine.

Despite having substantial explanatory power, some limitations of the TAM have been noted. The TAM posits perceived usefulness as the most significant determinant for technology adoption (Idris, Edwards, and McDonald, 2017). However, Fayad and Paper (2015) argue that individuals' expressed intention is not indicative of the actual use of technology. Bagozzi (2007) agrees that the focus on

use, TAM fails to consider the benefits of use and their actual attainment. Moreover, the TAM is more suitable for determining the use and acceptance of technology by individuals rather than by organizations Ajibade (2018). The decision by individuals to engage in eCommerce is voluntary, while the decision to use eCommerce technology in organizational settings is typically mandated by the company policy (Nyoro *et al.*, 2015). The decision by organizations to adopt an innovation is also considerably more complicated than that of individuals. Thus, the explanatory power of the TAM is limited when the adopting entity under investigation is an organization as in this study.

The TAM was therefore found to be unsuitable for the current study that seeks to investigate eCommerce adoption at an organizational level. Furthermore, eCommerce adoption by SMEs in developing countries is affected by a range of contextual issues such as shortage of infrastructure and cultural limitations, rather than just their behavioural intentions. According to Idris, Edwards, and McDonald (2017), the TAM is limited in its capacity to address the contextual factors affecting SMEs and therefore it was considered unsuitable for investigating the innovation factors affecting eCommerce adoption by SMEs in the developing country context of Botswana.

2.5.2. Technology, Organisation, Environment Framework (TOE)

The Technology-Organization-Environment (TOE) framework developed by Tornatzky *et al.* (1983), was also considered for this study. This framework suggests the technological context, the organizational context, and the environmental context as the three main constructs that influence a business' decision to adopt the technology. According to Nur, Wan and Mokhtar (2016), the technological context refers to the technology that is already in use and those that are available in the marketplace but not used in the organization. The concept of organizational context defines the nature of the business and its resources, such as the communication channels, firm size, and human resources. The environmental context comprises the characteristics of the environment in which the firm operates, including its industry, competitors, government regulations, and technology infrastructure Tornatzky *et al.* (1983).

Several studies have utilised the TOE to assess eCommerce adoption. Thaha *et al.* (2022) found that the TOE had a predictive capacity of 0.622 in assessing eBusiness adoption and the impact of eBusiness adoption on the value chain of Indonesian SMEs. Lippert (2006) used the TOE to better understand the key determinants of web services adoption at the firm level.

Despite its merits, various researchers have noted some limitations of the TOE framework. One of the limitations is that some of the constructs of the TOE are more applicable to large organizations which

typically have access to more resources than SMEs (Rahayu and Day, 2015). Furthermore, TOE ignores factors related to individual employee and manager attributes which are key to eCommerce adoption by SMEs. Thus, the framework was deemed to be insufficient to explain eCommerce adoption by SMEs. Some studies have integrated the framework with others to resolve these limitations. However, Idris, Edwards, and McDonald (2017) argue that despite the suggestions of these studies, the integrated frameworks still do not sufficiently address the unique contextual issues faced by SMEs in developing countries.

2.5.3. Diffusion of Innovation Theory

The Diffusion of Innovation theory (DOI) was also considered for this study. Rogers (1995) proposed the DOI theory to direct research on innovation acceptance and adoption among individuals and organizations. The DOI theory offers an assessment of the diffusion of technology based on the constructs of relative advantage, compatibility, complexity, trialability and observability. Rogers (1995) explains that technologies that are perceived to yield benefits and are compatible with the organizational culture can be tested, observed, and easy to use are considered to have a higher chance of diffusion and adoption. Rogers' DOI theory further suggests that the decision to use an innovation is a dynamic process that evolves, passing first from knowledge of an innovation, which occurs when an individual or organization, gains awareness of an innovation and can understand it. This forms the basis for the attitude which is then formed towards the innovation after being exposed to it, which in turn informs the decision to accept or reject the innovation. Using the innovation may then lead to implementation. Lastly, confirmation of the decision is made. The DOI model also categorizes adopters according to their level of innovativeness.

The DOI theory is among the most frequently cited theories in eCommerce adoption literature (Poorangi *et al.*, 2013). Pease and Rowe (2005) used the DOI to identify factors facilitating and inhibiting eCommerce adoption across different contexts.

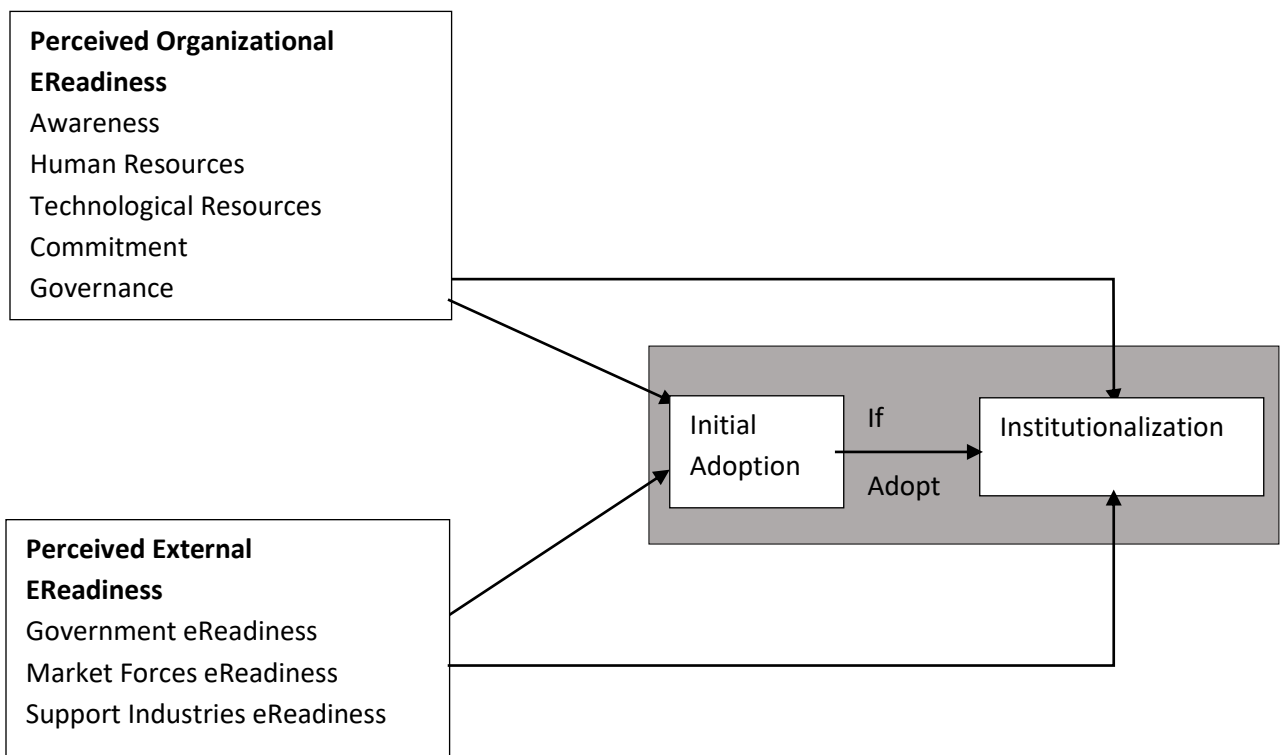
However, despite being applied to several studies on eCommerce adoption by SMEs, and its explanatory power lauded, some limitations of Rogers' DOI theory have also been noted. (Idris, Edwards and McDonald, 2017) suggest that the DOI is more appropriate for studying the actual usage of technology, particularly the testing of new technology to get feedback. Thus, this theory was found to be unsuitable for the current study which seeks to investigate the perceptions of Botswana SMEs towards eCommerce adoption.

2.5.4. Perceived eReadiness Model (PERM)

The PERM is a robust theoretical model that was specifically developed by Molla and Licker (2005) to assess eReadiness for eCommerce adoption in developing countries. According to Molla and Licker (2014), the concept of eReadiness in the developing country context offers new insights into the adoption and implementation of eCommerce by developing countries' businesses. Al-Hudhaif and Alkubeyyer (2011) and Idris, Edwards and McDonald (2017) suggest that the PERM is more comprehensive than other models and is better suited for assessing eCommerce adoption in developing countries contexts because it considers the unique dynamics that influence eCommerce adoption in developing countries.

The PERM (Molla and Licker, 2005) proposes a two-dimensional concept of eReadiness for eCommerce adoption in developing countries, representing internal and external eReadiness constructs: Perceived Organizational eReadiness (POER) and Perceived External eReadiness (PEER).

Figure 1: Conceptual representation of the PERM by Molla and Licker (2005)



Tan, Tyler, and Manica (2007) suggest that the PERM can help businesses in developing countries identify, measure, and manage the risks associated with eCommerce adoption activities. Al-Hudhaif & Alkubeyyer (2011) and Idris et al. (2017) assert the validity and credibility of the PERM by citing

that it covers a wide range of factors than earlier models as it takes into consideration both external environmental pressures and internal organizational factors. Molla and Licker (2005) found that all correlations between the major research constructs and their respective control variables in the organizational eReadiness and external eReadiness dimensions were quite high and significant at the 0.05 level, thereby showing evidence of predictive validity. Tan, Tyler and Manica (2007) used linear discriminant analysis to test the predictive capacity of the model. Our models were significant in predicting initial adoption ($F_{42,91} = 3.43, p < 0.001$) and the level of adoption ($F_{18,152} = 1.78, p = 0.032$). For predicting adoption, the most important variable was Government eReadiness (GVer), followed by Business Resources (BR) and Human Resources (HR).

Furthermore, the PERM considers eCommerce institutionalization which according to Kabanda (2011) has been a neglected area of research. According to Tran (2016), it is crucial not only to gain an understanding of the factors influencing the decision of SMEs in developing countries to adopt eCommerce, but also the factors that lead to the use of advanced eCommerce technology features. Institutionalization is a stage indicative of having a fully interactive, transactive, or integrated eCommerce (Molla and Licker, 2005). Ali, Miao and Tran (2013) suggest that the advanced use of technology innovations significantly improves business performance. However, Al-Hudhaif and Alkubeyyer (2011) found that most SMEs adopt eCommerce at the simple stage and rarely advance to an integrated phase and thus are unable to gain the full benefits from the technology. According to Tran (2016), studies on the factors that influence SMEs to advance from initial eCommerce adoption to institutionalization are key to understanding the adoption and success of eCommerce.

Although the PERM can be useful in the explanation and identification of the factors that determine the adoption of eCommerce by SMEs in developing countries, some limitations have been observed. According to Idris, Edwards, and McDonald (2017), while the model is frequently cited in research publications for theoretical purposes, few studies have applied it in their research. Molla and Licker (2005) and Tan, Tyler, and Manica (2007) suggest that there is a need to test and further validate the model in other contexts. A study in the Botswana context, therefore, provides further validation of the PERM in a different context and population. Idris, Edwards, and McDonald (2017) criticise the PERM for excluding important innovation determinants which limit the understanding of the full spectrum of factors that influence eCommerce adoption. Similarly, Sila (2013) has criticized the PERM for the exclusion of cultural and policy variables. Shemi (2012) found that the PERM emphasises organizational characteristics as being fundamental to the development of eCommerce in

the business. However, the literature review in this study establishes the key role of institutional and policy support for developing countries to successfully adopt eCommerce adoption.

Addressing the limitations of the PERM leads to a more comprehensive and accurate evaluation of the barriers impeding eCommerce adoption, and the specific factors facilitating eCommerce adoption by SMEs in developing countries. Thus, this study extends the PERM into a more rigorous and comprehensive framework. The extended model will lead to a more holistic understanding of the range of conditions and contingencies that shape eCommerce adoption in developing countries.

2.6.Extending the PERM

According to Nour (2016), technological advances have widened the gap between developed and developing countries, establishing an analytical significance for national innovation systems in the technology field. Chandra (2012) attributes this to the emergence of the knowledge-based economy and the increasing number of institutions involved in knowledge production in the economy. Zygiaris (2021) explores knowledge factors to consider towards supporting technological innovation. This study extends the PERM using variables grounded on the concepts discussed below.

2.6.1. Knowledge Flows

According to UNCTAD (2017), the growth of the digital economy has led to more knowledge-intensive economic activities. The national innovation system approach highlights the key role of knowledge in the economy (OECD, 1999). In the knowledge economy, knowledge is not only power, but profit. Innovation is presented as a knowledge-driven endeavour where emphasis is placed on factors that influence the relationship between the supply and demand of knowledge. This is especially true in the ICT domain where innovative ideas need the knowledge to be tested and successfully implemented (Chandra 2012). Knowledge is therefore essential for creating a robust ICT environment and capacitating SMEs for eCommerce uptake, management, and sustainability to ensure return on investment. According to Zygiaris (2021), the innovation system approach is a comprehensive analytical tool that can be used to manage the knowledge creation process, how knowledge is distributed and used, and how productivity, competitiveness, and social development are affected by these processes.

Lundvall (2007) explains that the process of knowledge diffusion includes research collaborations between industry, government, technology diffusion, and personnel movement. The scientific, design, engineering, and operational knowledge necessary for innovation must be accessible from different sources (Whitley, 2001). The tacit knowledge communicated through informal channels and the

codified knowledge shared through publications is both important aspects in the process to promote technological innovation by SMEs in developing countries (Whitley, 2001). However, the OECD (2017) found that SMEs are more dependent on tacit knowledge and less adept at accessing and utilizing codified knowledge. The NIS approach proposed by this study bridges this gap.

Although the world is rapidly transforming into a knowledge-based economy centred around science, technology, innovation, and advanced education, developing countries are still limited in their capacity to use knowledge as a tool for economic and social development (Kefela, 2010). Due to resource constraints, it is unlikely for individual SMEs to possess all the knowledge required for the entire process of innovation. Chandra (2012) suggests that collaboration with organizations and institutions that specialize in knowledge creation through research and development (R&D) such as universities and government research institutions, can help SMEs gain knowledge that enables them to participate in technological innovations, including eCommerce adoption.

According to Chiarini (2009), increasingly more private and public institutions are becoming part of the knowledge production and diffusion process. The success of businesses is increasingly contingent on their access to the knowledge produced by these institutions and their effectiveness in utilizing such knowledge (Borrás and Edquist, 2014; Gronning, 2008; Perry, 2017)). Developing countries can improve their technological innovation by gaining knowledge of existing ICTs and adapting technology created in developed countries (Aubert, 2004; Martinez-Frias, 2003). They require the knowledge to not only efficiently use imported technologies in the pursuit of their business objectives, but also to modify them to better suit their contexts (OECD, 1999). Chandra (2012) explains that successful innovative strategies for developing countries result from finding the best ways to access the growing global knowledge base and formulating strategies of how to direct domestic research and development (R&D) capacity toward innovation.

2.6.2. Networks

Nelson (1993) explains that innovation and technological progress are a consequence of the interaction of actors that generate, distribute, and apply knowledge. Actors in national innovation systems comprise businesses, universities, and public research institutes, including their personnel. Edquist (1998) suggests that the interaction between these innovation actors leads to innovation. According to Chandra (2012), the NIS category of institutions examines the political environment, government effectiveness and ease of doing business and how they relate to technological innovation.

The NIS approach considers innovations to be the result of an interactive learning process (OECD, 1997). Hekkert *et al.* (2007) suggest that the interactions in the economy yield new combinations of knowledge and can result in new knowledge creation leading to new processes and products. They explain that this interaction occurs between employees and departments within the business, between the business and customers, with other businesses, and between businesses and government agencies. According to Chandra (2012), governments in particular play a key role in promoting trust and relationships between the different NIS actors which is crucial for technological innovation.

According to Parkey (2012), interactions within the NIS enable cluster formations where a group of firms can pool resources to facilitate technological innovation. The support of institutions in the national innovation system increases the eReadiness of SMEs for eCommerce adoption (Jia, Tang and Kan, 2020). Chandra (2012) explains that complementary resources and capabilities such as knowledge resources, technology skills, and funding facilitate eCommerce entrepreneurship by ensuring that firms have access to more resources than what they can generate alone. This is particularly useful for SMEs which are limited in their capacity for eCommerce adoption.

2.6.3. Human Capital

According to Zygiaris (2021), the success of technological innovations depends on skilled and knowledgeable personnel. There is an increasing demand for highly skilled workers possessing the competencies to generate, apply and capitalise on knowledge and information (OECD, 2018). Thus, knowledge, as embodied in human beings, is central to technological innovation. The interactions among innovation actors enable producers and users of knowledge to learn from each other (Lundvall, 2016). The OECD (2014) explains that innovation centers, universities, industry bodies, and individual firms can all act as facilitation platforms or hubs to bridge the knowledge gap for SMEs thus providing the necessary human capital necessary for successful eCommerce implementation.

However, according to Howe (2015), the digital divide disproportionately affects developing countries due to a shortage of intellectual personnel. Nazir (2018) explains that the lack of technical and managerial knowledge in developing countries is a significant barrier to eCommerce adoption. In developing countries, where skilled personnel are scarce, SMEs find it difficult to recruit and retain qualified human resources. Alagu, Sundaram and Natarajan (2015) found that a lack of investment in education and training, innovation, and infrastructure, pose a challenge to eCommerce adoption. Lippert (2006) similarly identifies lack of access to strategic resources, such as skills, knowledge

networks, and capital as deterring factors to eCommerce adoption by developing countries' SMEs. Kshetri (2007) agrees that high illiteracy rates and low English fluency contribute to the low eCommerce adoption rate in developing countries. Because of a lack of training and resources, SMEs in developing countries typically have limited accounting practices where payments are generally made in cash, and receipts are hardly ever issued (Datta, 2011). It therefore becomes pertinent for governments and small business entrepreneurs to engage in eCommerce skills capacity building. There are various means through which people can be trained and educated, such as through the internet, distance learning and dedicated associations with universities. Alyoubi and Ph (2015) accredits the rise in the eCommerce adoption rate in India to using the Open University concept to reduce illiteracy. Thus, there is an apparent need to invest in improving the level of education including graduates in science, technology, and engineering, and increasing gross expenditure on research and development.

Travica *et al.* (2014) reported that although technical skills are growing, few managers are willing to champion eCommerce initiatives. They explain that the managers of SMEs in developing countries typically do not possess the requisite managerial expertise to successfully plan and implement eCommerce strategies. Based on this background, training and education is a critical success indicator of eCommerce adoption. Aboelmaged (2014) suggested specialized training and skills development programs to respond to this human capital demand. Furthermore, Tan, Tyler, and Manica (2007) found that educational qualifications are a significant influencing factor towards the growth of eCommerce adoption because the level of education determines occupation which has a direct impact on buying power and contributes to technology literacy thereby increasing the buying volume in eCommerce. Palepu *et al.* (2005) and Wresch and Fraser (2011) suggest that investment in skills can nurture trust in eCommerce by focusing on information and knowledge sharing. Parkey (2012) agrees that learning was the catalyst for the technological advancement of developing countries like Korea and Taiwan, was supported by the development of their NIS.

2.7. Summary

Based on the above discussion, it is apparent that while various theoretical frameworks and models have made key contributions to eCommerce adoption research, they are limited in their ability to adequately address the contextual factors that influence eCommerce adoption by SMEs in developing countries. This is largely because they are designed for developed countries' contexts. Therefore, they are unable to present an accurate reflection and representation of the businesses in developing countries because they operate through the lens of developed nations. The factors that influence the

decision by businesses in developed countries to adopt eCommerce may affect SMEs in developing countries differently and some factors that are inconsequential for developed countries may be crucial for developing countries. Thus, Idris, Edwards, and McDonald (2017) suggest that there is a need for a theoretical framework that explores eCommerce determinant factors beyond contextual imperatives. Nilsen (2015) recognizes the need for theories and frameworks to be tailored to the type of innovation under study and the adoption context. The PERM developed by Molla and Licker (2005) to assess the determinant factors affecting eCommerce adoption in developing countries from an eReadiness perspective is one such model. However, the PERM has some limitations. This study extends the PERM to address these limitations.

CHAPTER 3: RESEARCH MODEL

3.1. Introduction

This chapter provides a discussion and definitions of the constructs of interest based on the literature review in Chapter 3. The proposed research model is presented in this chapter followed by a discussion of the hypotheses associated with the model.

3.2. Constructs of Interest

This research assumes that successful eCommerce adoption and implementation by SMEs in developing countries depends on the coordinated effort of innovation actors. This is because although the covid-19 pandemic has led to an increase in eCommerce activities, SMEs in Botswana are still lagging behind. Other developing countries are similarly experiencing the problem of low eCommerce adoption among SMEs as discussed in Chapter 2. Thus, this study examined the key determinant factors believed to impact the eReadiness of SMEs for eCommerce adoption. The factors considered are: background, POER, PEER, and knowledge. The sections below provide descriptions of each factor that is relevant in the context of this study.

3.2.1. Background Factors

Tan, Tyler and Manica (2007) utilized the PERM to analyze business-to-business (B2B) eCommerce in China. Towards this objective, they extended the original PERM proposed by Molla and Licker (2005) to include industry descriptors of sector and firm size. The study found that B2B eCommerce adoption in China was significantly affected by firm size as it determines the availability of resources to invest in eCommerce. They note that while large firms have a financial advantage, the simple structure of SMEs enables them to easily adapt to new market needs. This study adopts the firm size variable posited by Tan, Tyler, and Manica (2007) because it becomes imperative to understand the firm itself to appreciate the relevant factors that can develop its capacity for eCommerce adoption.

Tan, Tyler and Manica (2007) posit a background variable to extend the PERM in their study to measure the impact of the educational background of employees on B2B eCommerce adoption in China. They found that Chinese businesses with highly educated employees were most likely to adopt eCommerce. This relates to the human capital structural factor of NIS which is of interest in this research (as discussed in Chapter 2). Qualified IT personnel is expected to be a reliable source of eCommerce knowledge. They are likely to appreciate the benefits of eCommerce and champion adoption in the business. Furthermore, they can source appropriate ICTs and can customize eCommerce systems to fit the needs of the business, and train other employees on using the systems.

These factors combine to increase the likelihood of eCommerce adoption and successful implementation. Thus, the background variable posited by (Tan, Tyler and Manica, 2007) is adopted for this study. This study provides further validation of the variables posited by (Tan, Tyler and Manica (2007) in the Botswana context.

3.2.2. Perceived Organizational eReadiness (POER)

Molla and Licker (2005) explain POER as the perceived level of awareness, resources, commitment, and organizational governance capacity to adopt eCommerce. It represents the analysis of an organization's understanding of eCommerce, its benefits and risks, and the availability of the necessary resources, procedures, and infrastructure to adopt eCommerce. This study provides further statistical validation of the POER variables developed by Molla and Licker (2005).

The following variables underly the POER construct as explained by Molla and Licker (2005), Molla and Licker (2014), and Tan, Tyler, and Manica (2007).

Awareness

Awareness refers to the extent to which organizations understand the potential risks and benefits of eCommerce.

Resources

The level of human, technological, and business resources available to an organization affects its capacity to adopt eCommerce. Human resources relate to the availability of personnel with IT skills, while technological resources refer to the IT infrastructure available in the business. Business resources explain how the business culture affects eCommerce adoption capacity.

Commitment

The support of management for IT initiatives is a critical success factor for eCommerce adoption.

Governance

The organizational structure of a business determines the strategic planning and resource allocation for eCommerce initiatives.

3.2.3. Perceived External eReadiness (PEER)

Molla and Licker (2014) explain to PEER as the extent to which external influences such as market forces, government, and supporting industries eReadiness are perceived to influence eCommerce adoption ventures. This study provides further validation of these PEER variables.

The following variables underly the PEER construct as explained by Molla and Licker (2005), Molla and Licker (2014), and Tan, Tyler, and Manica (2007).

Government eReadiness

Governments play a key role in eCommerce adoption through the formulation of policies, development of infrastructure and eCommerce adoption directives.

Market forces eReadiness

Pressure from competitors, suppliers, and customers is another critical influencing factor of eCommerce adoption.

Supporting industries eReadiness

The success of eCommerce initiatives depends on the support of industries such as courier services for the transport of goods, the affordability of IT services, and the support of the financial sector.

3.2.4. Knowledge

Two variables grounded in NIS literature were conceptualized in this study to provide an analysis of the role of knowledge on eCommerce adoption by SMEs as follows:

Networks

According to Chandra (2012), there is consensus that the systematic approach to innovation is effective in promoting technology innovation in the economy. Edquist (1998) explains that innovation is not a linear process, it requires continuous feedback loops between innovation actors, and across the different innovation stages. Parkey (2012) suggests that these relationships are important for the production and distribution of knowledge, and for developing policies (Albors-Garrigos, Hervas-Oliver and Hidalgo, 2009).

Sultz (2015) suggests that it is imperative for all stakeholders to participate in policy issues to ensure inclusive representation in discussions around policy. According to Parkey (2012), networks in the national innovation system help to improve the coordination of policy initiatives. The OECD (1997) explains that they reduce the risks of implicit bias against specific interests and help form an agreement around a mutually beneficial course of action (OECD, 1997). This is particularly useful to make sure that the interests of SMEs are not overlooked.

Networks in this study refer to the linkages among the institutions involved in the eCommerce adoption process.

Knowledge Flow

Molla and Licker (2014) recognize that awareness is a key determinant factor of innovation adoption. Ardjouman (2014) explains that for SMEs in developing countries to adopt eCommerce, they need to first be aware of the technology itself as well as its benefits and risks. It is imperative for SMEs in developing countries to have access to the global knowledge chain to have awareness of technological developments (Maloney, 2017). The knowledge of which technology will best suit their business needs is critical for successful eCommerce adoption. Furthermore, the decision to progress beyond basic functionality use depends on knowledge of more advanced functionalities and their benefits (Molla and Licker, 2014). However, due to their limited resources and unskilled managers, SMEs in developing countries are affected by a knowledge gap.

The knowledge flows construct in this study refers to the extent of access SMEs have to knowledge institutions.

3.3. eCommerce Adoption Level

Tran (2016) suggests that the definition of eCommerce adoption level by Molla and Licker (2005) is not extensive enough. This study agrees that a business that invests resources to build a static website indicates a readiness to adopt eCommerce, and therefore should be considered as an initial adopter. Al-Hudhaif and Alkubeyyer (2011) similarly suggest that a business spending money to build a static website is indicative of a higher intention and readiness to adopt. Thus, the PERM categories of the dependent variable eCommerce Adoption level were redefined as follows:

Non-Adopters

- Not connected to the internet, no email.
- Connected with email but no website.

Initial Adopters

- Static web, that is, publishing basic company information on the web without any interactivity.
- An interactive web that accepts queries, email, and form entries from users.

Institutional adopters

- Trans active web, that is online selling and purchasing of products and services including customer service.

- Integrated web, that is the website is integrated with suppliers, customers and other back-office systems allowing most of the business transactions to be conducted electronically.

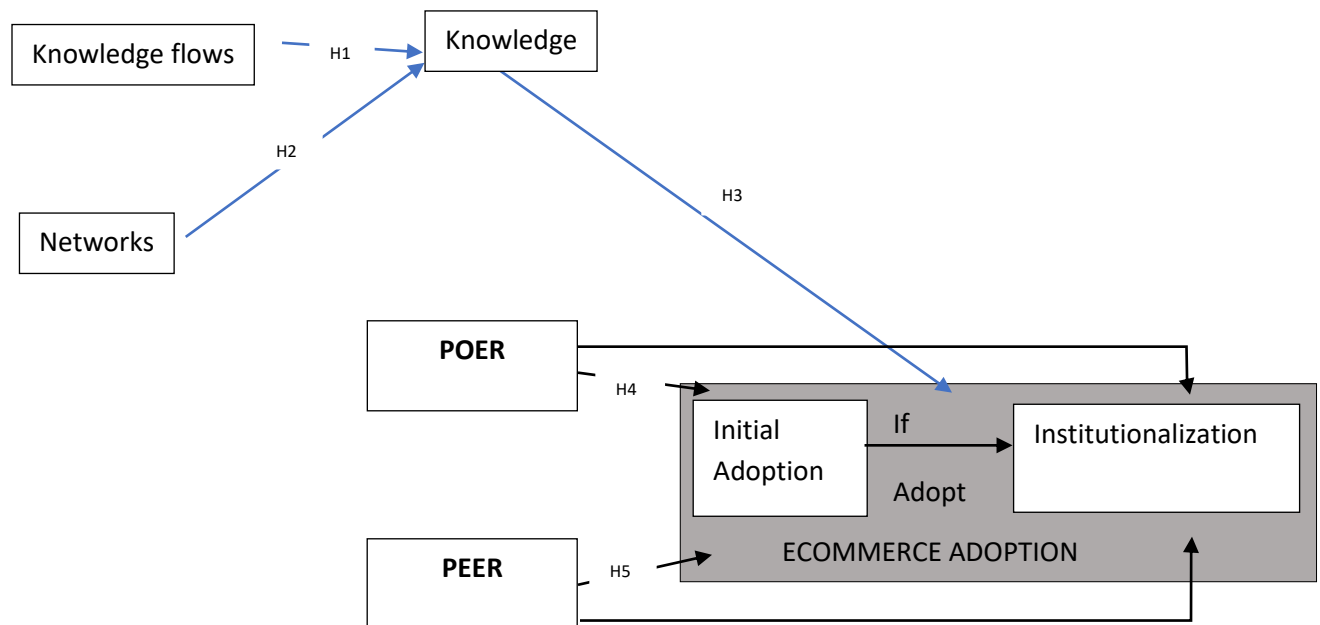
3.4. Hypotheses

After defining the research constructs and variables, the research hypotheses were formulated.

The overarching goal of this study, which is grounded in the PERM and extending NIS literature, was to address the problem of low eCommerce adoption among developing countries' SMEs. This research highlights the role of knowledge in facilitating technology innovation which is conceptualized by the network of innovation actors and the knowledge flows amongst them as discussed in Section 3.2.4 above. This research posits that knowledge is central to both initial eCommerce adoption and the decision to move from basic functionality to more advanced eCommerce.

The research objective is achieved by developing a new conceptual model of eCommerce adoption and testing this model through an empirical questionnaire survey. This study aims to provide a more comprehensive theoretical understanding of the key factors influencing the eReadiness of SMEs in developing countries to adopt eCommerce. This research model draws on the national innovation systems approach to innovation to extend Molla and Licker (2005)'s PERM. Figure 2 below illustrates the extended research model developed for this empirical study.

Figure 2: Hypotheses



The proposed model has five related hypotheses as follows:

Many studies have investigated the direct impact of knowledge on technology innovation (Albors-Garrigos, Hervas-Oliver and Hidalgo, 2009; Forman and van Zeebroeck, 2019; Nambisan and Wang, 2009; Ley, 2020; Xie *et al.*, 2022). However, few studies have studied the relationship between knowledge variables and eCommerce adoption. Hardilawati (2019) and Zygiaris (2021) are among those who have studied the relationship between knowledge in the NIS and eCommerce capacity. However, these studies suggest that there is a need to explore more variables. This study demonstrated that knowledge in the NIS directly impacts innovation. This relationship was investigated in the context of eCommerce. The following hypotheses were formulated as informed by the literature:

Hypothesis H1

There is a positive relationship between knowledge flows in the NIS and the extent of the eCommerce knowledge of SMEs' managers.

Hypothesis H2

There is a positive relationship between the network of institutions in the NIS and the extent of the eCommerce knowledge of SMEs' managers.

Hypothesis H3

There is a positive relationship between knowledge and eCommerce adoption.

Molla and Licker (2005), Tan, Tyler and Manica (2007), and Ali, Miao, and Tran (2013) established the role of internal organizational and external factors on the eReadiness of businesses in developing countries for eCommerce adoption. However, they agree that there is a need to validate the variables in other contexts. Therefore, the following hypotheses were formulated:

Hypothesis H4

There is a positive relationship between internal organizational eReadiness factors and eCommerce adoption.

Hypothesis H5

There is a positive relationship between external eReadiness factors and eCommerce adoption.

3.5. Summary

This chapter describes the constructs of the study. It also presented the proposed research model and provided justification for the related hypotheses.

CHAPTER 4: METHODOLOGY

4.1. Introduction

This chapter provides a description of the process involved in the generation of data and information relating to the research topic and rationalized according to the research objectives and hypotheses. The research questions posed by this study are exploratory. The research is designed around the critical paradigm. The following sections present a discussion of the techniques used to address the research questions.

4.2. Research Type

According to (Bhattacharjee, 2012) research can be classified as exploratory, descriptive, and explanatory, depending on the purpose and the nature of the problem under study. Exploratory research is often conducted in new areas of enquiry, to find out what is happening, and to gain new insights on a phenomenon, problem, or behavior. Descriptive research seeks to make careful observations and detailed documentation of a phenomenon, problem, or behavior, based on the scientific method, which dictates that they must be replicable, precise, making them more reliable than casual observations. Explanatory research is directed at finding explanations of observed phenomenon, problems, or behaviors. The causal factors and outcomes of the target phenomenon are identified.

The purpose behind this study was to investigate the eReadiness factors affecting eCommerce adoption by SMEs in Botswana. Based on this, explanatory and descriptive approaches were considered to be appropriate for this study. An explanatory approach is used to investigate and gain an in-depth understanding of the different factors that influence the readiness of Botswana SMEs for eCommerce adoption, while the descriptive aspect of the study seeks to reveal how these factors have affected the rate of eCommerce adoption among Botswana SMEs.

4.3. Research Paradigm

(Rehman, 2011) categorizes Information Systems research into positivist, interpretive, and critical paradigms. Positivists strive to understand the social world like the natural world. Positivism assumes that theory and observations are dependent on each other (Bhattacharjee, 2012). While theories may be created through reasoning, they must be verified through observations in order to be considered as valid. According to (Rehman, 2011), positivism posits that through the application of appropriate measurement tools, scientific methods, the laws governing social phenomena can be formulated and presented through factual statements. This approach has however been criticized because while it is considered to be appropriate for studying natural phenomenon, it is not as successful when applied on

social phenomenon. Interpretivism, rejects the idea that a single, verifiable reality exists. Instead, interpretivists believe in multiple socially constructed realities. Interpretive research attempts to understand people's views about the social phenomena they interact with. However, the interpretive paradigm has been criticized for its incapability to yield theories that could be generalized to larger populations.

The critical paradigm assumes that reality is shaped by cultural, political, ethnic, gender, and religious factors, which interact with each other to create a social system (Rehman, 2011). (Bhattacharjee, 2012) adds that critical research not only seeks to explain and understand the facilitating and inhibiting conditions in society, but seeks to eliminate the barriers that lead to inequality. This study therefore adopted a critical paradigm as it sought to gain a comprehensive understanding of the internal and external factors affecting the readiness of SMEs in Botswana for eCommerce adoption, which will result in practical and theoretical contributions towards the facilitation of higher eCommerce adoption rates. Moreover, because the critical paradigm allows the researcher to make multiple interpretations from the research question, more factors are revealed, thus providing a better understanding of the problem under study.

4.4. Research Approach

Depending on the nature of the problem under study, a qualitative or quantitative approach can be used. Qualitative researchers seek better understandings of complex situations. Qualitative research is often exploratory in nature, and builds theory from the ground up based on observations.

Quantitative research seeks explanations and predictions that are generalizable to other persons or places. (Myers, 1997) explains that the intent of quantitative research is to identify relationships among variables, and to confirm or modify existing theories or practices. This approach was considered to be appropriate for this study, which aims to investigate SMEs eReadiness factors for eCommerce adoption in Botswana, based on an existing PERM.

4.5. Approach to theory

Depending on the research interest, scientific inquiry may take two possible forms. The goal in inductive research is to infer theoretical concepts and patterns from observed data. This study follows the deductive approach which seeks to test concepts and patterns known from theory using new empirical data. (Berntsen, Sampson and Østerlie, 2000) notes that the goal of deductive research is not merely to test a theory, but to possibly refine, improve, and extend it. This study seeks to mitigate

the limitations of the PERM by extending it towards a more comprehensible framework. Hence, a deductive approach was followed.

4.6. Survey Participants

This study set out to survey SMEs in Botswana. Since it was impractical to survey all existing SMEs in Botswana due to time, cost, and resource limitations, a representative subset of the SMEs in Botswana was randomly selected to infer and determine the trends of eCommerce adoption and eReadiness among Botswana SMEs. This study surveyed SMEs across seven locales in Botswana: Palapye, Serowe, Mahalapye, Francistown, Gaborone, Selibe-Phikwe and Maun. These areas were chosen based on the convenience of access for the researcher.

4.7. Survey Strategy

This study follows a quantitative research approach which according to (Myers, 1997) requires a large sample to be accurately representative of the population. Surveys are a method of gathering information from a group of people by asking them questions. According to (Kelley *et al.*, 2003) surveys allow for large amounts of data to be collected from respondents within a short period of time and at a relatively low cost. Thus, this study used the survey method to collect data from a larger, more representative sample. Furthermore, according to Bhattacharjee (2012) surveys are less expensive than other data collection methods. Due to our limited research budget, the survey approach was therefore considered appropriate for this study. There are several methods that can be used to answer the research question using the survey approach such as mail surveys, face-to-face surveys, telephone surveys, and online surveys. Mail surveys are where questionnaires are delivered directly to respondents through the post office. In face-to-face surveys, questionnaires are personally delivered to respondents by the research team, while an online survey is a structured questionnaire that your target audience completes over the internet through filling out a form. Telephone surveys on the other hand are a method of data collection where researchers contact respondents via telephone and ask them a list of questions.

The data used in this study was collected through three phases, starting with a mail survey, followed by an email survey, and finally, the questionnaires were hand delivered to prospective participants. Initially, this study utilised the mail survey method as it is considered more valuable compared to other methods of surveying. They often feel more personalised as they are going to a specific name and address, which can prompt respondents to complete the survey. We supplied respondents with

envelopes and postage stamps to aid the return of completed questionnaires. However, the return rate was low. To get a larger, more representative sample, we embarked on a second wave using the online survey method. We prepared the questionnaire using google forms and emailed it to respondents. The responses were still too few to form an accurate representation of the population so we embarked on a third wave face to face survey.

4.8. Instrument

This research study used a quantitative research approach, where eCommerce adoption by SMEs was treated as a variable that can be measured using a questionnaire. The Perceived eReadiness Model Questionnaire (PERMQ) (attached in Appendix B) which was adopted and extended from (Molla and Licker, 2005) was used in this study to investigate the eReadiness factors that facilitate or impede eCommerce adoption by SMEs in the developing country context of Botswana. The PERMQ covers 33 items of POER, and 10 items of PEER measured using a 5-point Likert scale that ranges from strongly agree (1) to strongly disagree (5) provided as response options for all the items, with only one response allowed for each item. Additionally, the questionnaire contains 1 item which acts as the dependent variable to determine the level of eCommerce adoption, which will be used in this study to assess validity of the model.

Three items proposed by (Tan, Tyler and Manica, 2007) are adopted to measure firm demographics. These variables are covered by questions B1, B2, and B3 (in Appendix B) and have been validated by (Tan, Tyler and Manica, 2007). Another background question “B4” was formulated in this study to investigate how access to IT personnel influences eCommerce adoption by developing countries’ SMEs. This is related to the human capital category of national innovation systems.

Additionally, three questions were adopted from the World Bank Enterprise survey to extend the original PERM instrument. The questions were restructured to fit the current study based on guidelines by (OECD, 2005) on developing firm-level surveys on innovative activities. One item was formulated to measure knowledge flows (KNWFLO), and two items to measure networks (NET).

Table 1: Questionnaire items

Items	Construct
1-3	Demographics
4-5	Knowledge flows
6-7	Networks
8-14	Awareness
15-16	Human resources
17-22	Business resources

23-28	Technical resources
29-37	Governance
38-39	Market forces eReadiness
40-43	Government eReadiness
44	eCommerce adoption

4.9. Data Collection

The PERMQ used in this study was distributed through three waves. Initially, a sample of 1000 SMEs from various industry sectors was randomly selected from the public telephone directory. Questionnaires were sent to a random sample of SMEs listed in the telephone directory around the country through snail mail. Only 53 responses were received, a 5.3% response rate. As this number was too low to draw an accurate generalization, a follow-up email survey was conducted to 1500 SMEs from the same telephone directory, to which the response rate was only 1.1%, as some of the email addresses were invalid. The low response rate to the email survey is considered indicative of the low internet usage among Botswana SMEs.

Following the suggestion by the (OECD, 2017) that businesses in developing countries tend to value personal relationships and a suggestion by (Shemi, 2012) that SMEs in Botswana tend to value personal relationships over online interactions, a third wave of the questionnaire survey was deployed. The purpose of the study, information about consent, and the questionnaire were explained to the participants directly on site. Consent was obtained from the participants before they filled in the questionnaire and the researcher was available to answer any questions. The answered questionnaire was returned to the researcher immediately after completion. In some instances, the questionnaire was delivered in person and would be collected later at an agreed date. The researcher would call the participants a day before to remind them before collecting the questionnaire in person.

800 SMEs were randomly selected from Botswana Business Directory, which lists registered businesses in Botswana, their contacts, and provides a map of the location of the business. Questionnaires were distributed in Gaborone, Francistown, Serowe, Palapye, Mahalapye, Selibe-Phikwe, and Maun. These locations were selected based on convenience of access to the data collection team, given the limited budget. However, the sample was considered to be representative of Botswana SMEs based on the Census of Enterprises and Establishments Report by Statistics Botswana (2016) that found that these are some of the top locations of registered businesses in the

country. The report shows 6128 registered businesses in Gaborone, 1733 in Francistown, 3081 in the central district which in this study is represented by Palapye, Serowe, and Mahalapye, 602 in Selibe-Phikwe, and 1322 in Ngamiland district, represented by Maun.

Questionnaires were distributed in person by the researcher and a team of 5 data collectors to SMEs across the selected locales in Botswana from July 2019 to February 2020. The questionnaires were administered to SME managers and IT personnel. 510 responses were obtained (a 63.3% return rate). Out of 510 responses, 11 were excluded as many of the questions were unanswered.

A final sample size of 569 was obtained for this study. The answers were then coded and uploaded into an excel workbook.

4.9.1. Data Codification

Data collected from the study was then recorded in a Microsoft Excel codebook containing detailed descriptions of each variable in the research study. The information regarding each variable in the research was documented in a standard format in the codebook as follows:

Variable name: Specific questions within each factor being studied were assigned abbreviations along with a number for identification (e.g., NET1 for the first question in Networks).

Question wording: a spreadsheet linking to the data sheet containing the full question wording used in the survey was created.

The data was converted into a machine-readable, numeric format on the Microsoft Excel spreadsheet to enable analysis using the Statistical Package for the Social Sciences (SPSS) computer program. The items in this study were measured on a five-point Likert scale ranging from strongly agree to strongly disagree. The items were coded a 1 for strongly agree, 2 for agree, 3 for neutral, 4 for disagree, and 5 for strongly disagree. Dichotomous data was coded 1 for yes and 2 for no. Nominal data such as industry type and educational level were also coded. After the data was coded, it was now ready for statistical analysis.

4.9.2. Data Screening

Missing data: the data was screened for any missing values using the frequency procedure in SPSS version 27. (Mertler and Reinhart, 2016) recommends the mean score as the best approximate value to replace missing data in the absence of other information. Hence, following this recommendation the missing data was replaced with a mean score.

Outliers: We created boxplots and scatterplots in SPSS 27 to analyse the data for any outliers. An investigation was then made to determine the cause of the outliers. The decision to keep the outliers in the dataset was informed by their values on the variable.

4.10. Data Analysis

To understand the demographic background of the survey respondents, descriptive statistics were used to illustrate the survey data. The instrument was then evaluated for its statistical reliability and validity. The reliability function in SPSS27 was used to calculate Cronbach's Alpha for each construct item to measure the reliability of the scale. Exploratory factor analysis was conducted to assess the validity and unidimensionality of the instrument by examining the correlation coefficient. Furthermore, confirmatory factor analysis was used to assess the construct validity of the measurement scale.

The model was then tested using Structural Equation Modeling (SEM). According to Westland (2015), SEM is more accurate at describing complex relationships than multivariate statistics techniques. Stein *et al.* (2017) explain that SEM provides a statistically efficient method of answering questions that involve the multiple regression analysis of factors. SEM enables the comprehensive assessment of relationships. The SEM approach provides a holistic view of the research model. This study used IBM SPSS Amos 26 to conduct SEM. Barnidge and Zúñiga (2017) describe Amos as a powerful structural equation modeling software that extends standard multivariate analysis methods to support research and theory.

The model's fit to the data was tested. Then path analysis was conducted to assess the effect of the independent variables on the dependent variable. Lastly, an exploratory analysis of the model was conducted to investigate any relationships between the constructs that had not been established in previous studies.

4.11. Ethical Considerations

Several considerations were made to ensure the integrity of the data collected. First, the questionnaire, ethics form, and an information sheet were approved by the Human Research Ethics Committee (HREC) at both the Botswana International University of Science and Technology the University of Wollongong (UOW) before data collection was commenced. Moreover, a research proposal describing the research study was submitted to the Botswana Department of Research, Science and Technology, and upon approval, a research permit was issued.

Other considerations were made based on Bhattacharjee, (2012)'s guide to ethical research. The participation of organizations in the study was completely voluntary and free from coercion and participants were at liberty to withdraw their participation at any time within the active study period without negative consequences on the relationships with any of the researchers or the Universities of BIUST and UOW. There was no pressure to continue, and no explanations were required for withdrawal because participants reserved the right to exit the study at any time. Moreover, the confidentiality and privacy of the participants was protected. Respondents were not expected to fill in any names or identifiers. This endured that participation was anonymous and the data cannot be linked to individual participants. Furthermore, contact lists and recruitments records were destroyed when data collection was completed. Surveys will be stored by the Botswana International University of Science and Technology for five years after which they will be destroyed. The data collected was only accessible to the research team and will only be used for the purposes of this study and research publications associated to it. Additionally, the study is accountable to the BIUST and University of Wollongong Human Research Ethics Committees.

A consent form that clearly describes the research being conducted was attached to the research questionnaire. An information sheet (Appendix A) providing information on the purpose of the project, how the collected data will be used, and who will have access to the data, was given to participants along with the questionnaire. Thus, participants could make an informed decision as to whether they wished to participate in the study. In addition, the researchers' contact information was availed to participants in case the participant becomes concerned in any way during their participation.

4.12. Summary

This chapter describes and provides justification for the research methods employed in this study. This research was conducted through a quantitative approach using a questionnaire survey. This chapter also discusses the ethical considerations.

CHAPTER 5: RESULTS

5.1. Introduction

This chapter reports the results of the statistical analysis. The results of the reliability and validity of the model is presented as well as the results of the hypotheses testing.

5.2. Demographic Analysis

According to Tan, Tyler and Manica (2007), the demographic factors of businesses affect their eReadiness for eCommerce adoption. Table 2 below presents the demographic characteristics of the respondents.

Table 2: Demographic profile of respondents (N=569)

		Frequency		Percentage (%)
Industry	• Goods	314		55.18
	• Services	255		44.81
Number of employees	• 25 – 50	55		9.67
	• 50 – 100	38		6.68
	• Less than 25	476		83.66
Educational background	• BGCSE	465		81.72
	• Undergraduate	91		15.99
	• Higher than undergraduate	13		2.28
Permanent IT staff	• Yes	64		11.24
	• No	346		60.80
	• Occasionally (as needed)	159		27.94
ECommerce adoption rate		Goods	Services	
	Non-adopters	273	167	77.33
	Initial adopters	38	88	22.14
	Institutional adopters	3	0	0.53
ECommerce adoption category	Not connected to the Internet, no e-mail	39		6.85
	Connected to the Internet with e-mail but no web site	401		70.47
	Static Web, that is publishing basic company information on the web without any interactivity	36		6.33
	An interactive web presence that is	90		15.82

	accepting queries, e-mail; and form entries from users		
	Trans active web, that is online selling and purchasing of products and services including customer service	3	0.53
	Integrated web, that is the web site is integrated with suppliers, customers and other back-office systems allowing most of the business transactions to be conducted electronically	0	0

There were 314 SMEs that trade goods and 255 SMEs that offer services. 84% of the SMEs had less than 25 employees, most of whose highest educational qualification was BGCSE (82%). 10% of the SMEs surveyed had 25 to 50 employees, while 7% had between 50 and 100 employees. For the level of education, 16% (n = 91) of the SMEs had employees who had attained undergraduate degree, and 2% (n = 13) had attained higher than an undergraduate degree. Only 11% (n = 64) had permanent IT staff in-house, and 61% (n = 346) did not have any IT staff, while 11% (n = 64) stated that they hire IT consultants on occasion as the need arises.

The descriptive statistics show 77.33% of the participants to be non-adopters, with SMEs in the goods industry having the lowest level of adoption (n = 273). 6.85% (n = 39) of the participants were not connected to the internet at all, while most of the participants 70.47% (n = 401) had email addresses but no website. 22.14% (n = 126) of the participants were initial adopters with 6.32 (n = 36) having static websites that are publishing basic company information without any interactivity, and 15.82% (n = 90) participants had an interactive website that is accepting queries, e-mail, and form entry from users. Only 0.52% (n = 3) of the participants were institutional adopters with a transactive website that allows the selling and purchasing of products and services including customer service. None of the participants had a website that is integrated with suppliers, customers, and other office systems allowing most of the business transactions to be conducted electronically.

5.3. Reliability Analysis

Bolarinwa (2015) describes reliability as a measure of the degree to which the analysis of a construct is consistent. That is, repeated analysis of the same construct using the same scale is expected to produce similar results if the underlying phenomenon remains constant. All questionnaire items should reflect the same underlying concept of eCommerce adoption. Cronbach alpha values were computed using SPSS27 to assess the reliability of the constructs. Cronbach's alpha is commonly used by academic statisticians to demonstrate internal consistency reliability measured from 0 and 1. The internal consistency of the instrument was measured in this study. Internal consistency is the extent to which all the questionnaire items measure the same construct (Tavakol and Dennick, 2011). This study follows the minimum criterion value of 0.8 observed by (Molla and Licker, 2005) as evidence of reliability. The coefficient alpha for all items of the PERMQ in this study meets the acceptable criteria, which describes the interaction between the 596 respondent SMEs and the 61 questionnaire items. Table 3 below shows the results of the reliability test.

Table 3: Scale reliability

Scale	No. of Items	Cronbach's Alpha
Background	9	.847
Knowledge Flow	3	.811
Networks	6	.851
Awareness	7	.813
Human Resources	2	.820
Business Resources	6	.827
Technology Resources	5	.795
Commitment	5	.796
Governance	8	.792
Market Forces EReadiness	4	.821
Government EReadiness	2	.828
Supporting Institutions EReadiness	4	.819
Total	61	

Three items: technology resources, commitment, and governance returned a reliability score of 0.79. As there was not much discrepancy in the set criterion, these were also considered reliable for this study.

5.4. Content Validity

This study extended the PERM instrument developed by (Molla and Licker, 2005) based on concepts about eReadiness, the digital divide, the national innovation system, and the goals of the researcher.

Once the instrument was extended, the aim was to validate its accuracy by conducting an item analysis of the constructs.

A content validation form (attached in Appendix C) was prepared and distributed to 6 experienced colleagues. As per the recommendation by (Saiful and Yusoff, 2019), the definition of constructs and the items that represent the construct were provided in the content validation form to ensure a clear understanding of the task. The experts were asked to critically review the new variables being introduced into the model and determine whether they fit with the original constructs developed by (Molla and Licker, 2005) before providing a score on each item, and assessing whether any of the original items are problematic in the Botswana context. The panel were requested to comment on the relevance of each item on the eReadiness of SMEs for eCommerce adoption. All comments were then taken into consideration to refine the questionnaire.

The experts were requested to score each independent item on a 4-point Likert Scale ranging from 4 (very relevant), 3 (relevant), 2 (somewhat relevant), to 1 (not relevant). The ratings of item relevance by the experts were then used to calculate the content validity index (CVI) to measure the extent to which the items address the construct under study. All items, including the items developed by this study were found by the experts to be relevant in the Botswana context with a high proportion of items scoring between 3 and 4 on a relevance scale resulting in a total scale-level content validity index based on the universal agreement method (S-CVI/UA) of 0.93. This score meets the suggestion by (Saiful and Yusoff, 2019) that measures the universal agreement score (UA) between 1 and 0, with 1 reflecting 100% agreement among experts.

5.5. Test of normality

SPSS was used to test the data for normality. Data was collected from a sample size more than 100, therefore we rely on Kolmogorov-Smirnov to determine normality. Table 4 below shows that the significance for each scale in the questionnaire was greater than 0.05 ($p > 0.05$) therefore was normally distributed. Parametric tests were appropriate as the data is nominal.

Table 4: Tests of normality

Tests of Normality

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
KnowledgeFlow	.182	593	.122	.854	593	<.117
Network	.383	593	.075	.594	593	<.052

Background	.315	593	.155	.790	593	<.005
Awareness	.145	593	.195	.936	593	<.082
HumanResources	.207	593	.281	.848	593	<.177
BusinessResources	.222	593	.101	.888	593	<.250
TechnologyResources	.242	593	.221	.804	593	<.222
Commitment	.093	593	.177	.955	593	<.451
Governance	.155	593	.253	.950	593	<.551
MarketForceeseReadiness	.285	593	.051	.821	593	<.371
GovernmenteReadiness	.202	593	.097	.855	593	<.118
SupportingIndustrieseReadi ness	.193	593	.192	.878	593	<.092

a. Lilliefors Significance Correction

5.6. Instrument Validation

Exploratory factor analysis was conducted, and the correlation coefficient tested to determine the validity and unidimensionality of the scale.

5.6.1 Exploratory Factor Analysis

SPSS27 was used to conduct exploratory factor analysis through a principal component approach. The process suggested by (Alanazi, 2013) was followed. Scale items are analyzed below. There was no need for factor reduction for human resources and market forces eReadiness as they both had only 2 items. After establishing a correlation of items within each variable, factor analysis was conducted to test the correlation between the model variables themselves.

5.6.1.1 Knowledge Flows

Table 4 below shows the correlation matrix for the eleven items used in this study to measure knowledge flows. All the correlation coefficients meet the cut-off point suggested by (Schober and Schwarte, 2018) of being greater than 0.3. Thus, the measurement items were considered suitable for factor analysis.

Table 5: Correlation matrix for knowledge flows

		Correlation Matrix						
		KNW1	KNW2	KNW3	KNW4	KNW5	KNW6	KNW7
Correlation	KNW1	1.000	.397	.418	.414	.252	.309	.398
	KNW2	.397	1.000	.493	.459	.367	.702	.408
	KNW3	.418	.493	1.000	.909	.605	.486	.502

	KNW4	.414	.459	.909	1.000	.616	.474	.556
	KNW5	.252	.367	.605	.616	1.000	.542	.387
	KNW6	.309	.702	.486	.474	.542	1.000	.430
	KNW7	.398	.408	.502	.556	.387	.430	1.000
	KNW8	.215	.598	.390	.352	.438	.738	.331
	KNW9	.362	.454	.465	.443	.392	.388	.536
	KNW10	.341	.345	.452	.479	.370	.349	.657
	KNW11	.389	.439	.512	.490	.418	.411	.567

		Correlation Matrix			
		KNW8	KNW9	KNW10	KNW11
Correlation	KNW1	.215	.362	.341	.389
	KNW2	.598	.454	.345	.439
	KNW3	.390	.465	.452	.512
	KNW4	.352	.443	.479	.490
	KNW5	.438	.392	.370	.418
	KNW6	.738	.388	.349	.411
	KNW7	.331	.536	.657	.567
	KNW8	1.000	.237	.272	.318
	KNW9	.237	1.000	.570	.730
	KNW10	.272	.570	1.000	.619
	KNW11	.318	.730	.619	1.000

Additional analysis to determine the suitability of the data set for factor analysis was conducted by calculating the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity. (Field, 2009) suggests a cut-off KMO value of greater than 0.5. Table 5 below shows a KMO value of 0.859 and a highly significant Bartlett's test of sphericity ($p < .001$). All these statistics point to the data being appropriate for factor analysis.

Table 6: KMO and Bartlett's Test for knowledge flows

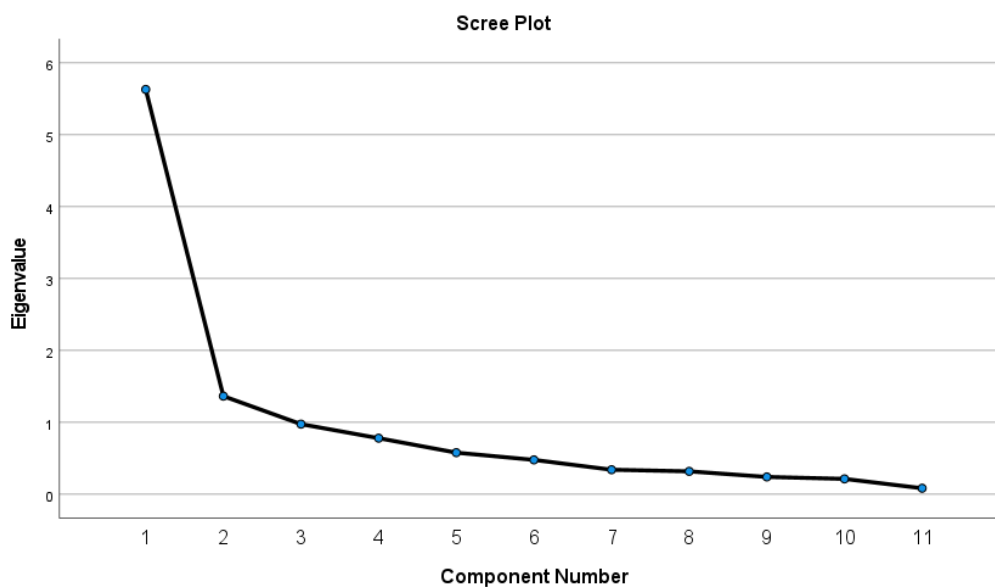
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.859
Bartlett's Test of Sphericity	Approx. Chi-Square	4049.383
	Df	55
	Sig.	.000

The Eigenvalue was computed to determine the number of components in the scale and the scree plot was graphed. Table 6 below shows the eigen value of the knowledge flows construct. Similarly, figure 3 shows the scree plot of the construct.

Table 7: Eigenvalue for knowledge flows

Component	Total Variance Explained					
	Total	Initial Eigenvalues		Total	Extraction Sums of Squared Loadings	
		% of Variance	Cumulative %		% of Variance	Cumulative %
1	5.630	51.180	51.180	5.630	51.180	51.180
2	1.364	12.400	63.580	1.364	12.400	63.580
3	.975	8.861	72.441			
4	.779	7.086	79.527			
5	.578	5.257	84.784			
6	.478	4.342	89.126			
7	.341	3.096	92.222			
8	.318	2.893	95.115			
9	.241	2.187	97.302			
10	.213	1.940	99.242			
11	.083	.758	100.000			

Figure 3: Knowledge flows plot



The factor loading of scale items was then computed. This study follows the factor loading of greater than 0.2 recommended by (Field, 2009). Table 6 above shows that the factor loading for the item

exceeds the cut-off point. The previous tests indicate that all eleven items of knowledge flows are unidimensional.

5.5.1.2 Networks

Table 7 below illustrates the correlation matrix for the seven items used to measure networks. The correlation coefficients meet the cut-off point of >0.3 recommended by (Field, 2009).

Table 8: Correlation matrix for networks

		Correlation Matrix					
		NET1	NET2	NET3	NET4	NET5	NET6
Correlation	NET1	1.000	.395	.429	.817	.539	.373
	NET2	.395	1.000	.350	.369	.374	.660
	NET3	.429	.350	1.000	.392	.675	.415
	NET4	.817	.369	.392	1.000	.496	.398
	NET5	.539	.374	.675	.496	1.000	.365
	NET6	.373	.660	.415	.398	.365	1.000

The KMO value of the networks construct is 0.734 as shown in table 8 below which is above the cut-off point. Bartlett's test of sphericity is also highly significant ($p<.001$). The data was therefore deemed appropriate for factor analysis.

Table 9: KMO and Bartlett's Test for networks

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.734
Bartlett's Test of Sphericity	Approx. Chi-Square	1680.591
	Df	15
	Sig.	.000

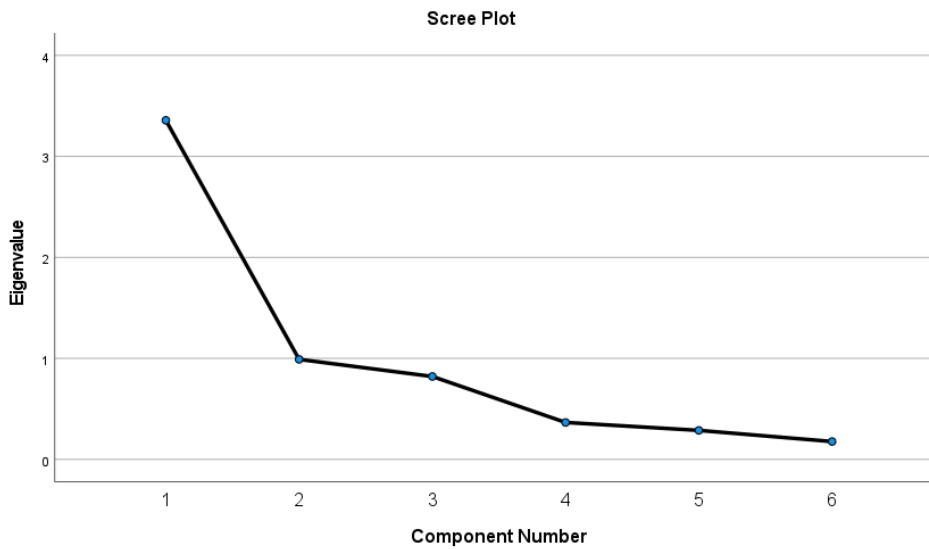
The eigenvalue was computed, and the scree plot was plotted. Table 9 and the scree plot in figure 4 shows one component with a corresponding eigenvalue of 3.585.

Table 10: Eigenvalue for networks

Total Variance Explained						
		Initial Eigenvalues		Extraction Sums of Squared Loadings		
Component	Total	% of	Cumulative	Total	% of	Cumulative
		Variance	%		Variance	%

1	3.358	55.965	55.965	3.358	55.965	55.965
2	.990	16.508	72.474	.990	16.508	72.474
3	.821	13.687	86.161			
4	.366	6.098	92.259			
5	.287	4.791	97.050			
6	.177	2.950	100.000			

Figure 4: Networks plot



The previous tests provide proof of the unidimensionality of the six items of networks as they exceed the recommended cut-off factor loading of 0.21.

5.5.1.3 Awareness

The correlation matrix of the seven items used to measure awareness is shown in table 10 below. These items are suitable for factor analysis as indicated by correlation coefficients which are greater than 0.3.

Table 11: Correlation matrix for awareness

		Correlation Matrix						
		A1	A2	A3	A4	A5	A6	A7
Correlation	A1	1.000	.777	.167	.521	.228	.433	.398
	A2	.777	1.000	.150	.424	.181	.394	.367
	A3	.167	.150	1.000	.435	.750	.420	.385
	A4	.521	.424	.435	1.000	.462	.668	.614
	A5	.228	.181	.750	.462	1.000	.461	.436
	A6	.433	.394	.420	.668	.461	1.000	.823

A7	.398	.367	.385	.614	.436	.823	1.000
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The KMO value of the awareness construct is 0.755 as shown in table 11 below which is above the cut-off point. Bartlett's test of sphericity is also highly significant ($p < .001$). The data was therefore deemed suitable for factor analysis.

Table 12: KMO and Bartlett's Test for awareness

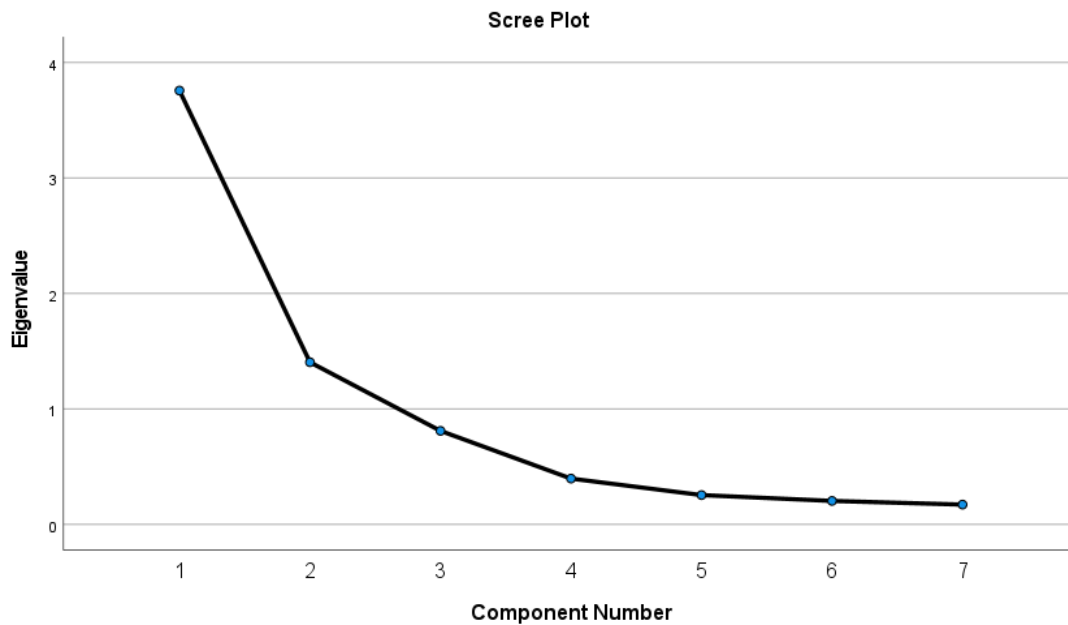
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.755
Bartlett's Test of Sphericity	Approx. Chi-Square	2361.664
	Df	21
	Sig.	.000

Table 12 below shows one component with an eigenvalue of 3.757, which is confirmed by the scree plot in figure 5.

Table 13: Eigenvalue for Awareness

Total Variance Explained						
Component	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.757	53.674	53.674	3.757	53.674	53.674
2	1.405	20.068	73.742	1.405	20.068	73.742
3	.810	11.578	85.319			
4	.397	5.676	90.995			
5	.254	3.634	94.629			
6	.204	2.912	97.541			
7	.172	2.459	100.000			

Figure 5: Awareness plot



The previous tests provide proof of the unidimensionality of the six items of awareness as they satisfy the recommended factor loading of greater than 0.21.

5.5.1.4 Business Resources

The correlation matrix of the six items used to measure business resources is shown in table 13 below. These items are suitable for factor analysis as indicated by correlation coefficients which are greater than the 0.3 cut-offs.

Table 14: Correlation matrix for business resources

		Correlation Matrix					
		BR1	BR2	BR3	BR4	BR5	BR6
Correlation	BR1	1.000	.684	.391	-.039	.376	.212
	BR2	.684	1.000	.470	.025	.245	.338
	BR3	.391	.470	1.000	.038	.548	.342
	BR4	-.039	.025	.038	1.000	-.113	.197
	BR5	.376	.245	.548	-.113	1.000	.068
	BR6	.212	.338	.342	.197	.068	1.000

The KMO value of the business resources construct is 0.628 as shown in table 14 below which is above the cut-off point. Bartlett's test of sphericity is also highly significant ($p < .001$). The data was therefore deemed suitable for factor analysis.

Table 15: KMO and Bartlett's Test for business resources

KMO and Bartlett's Test

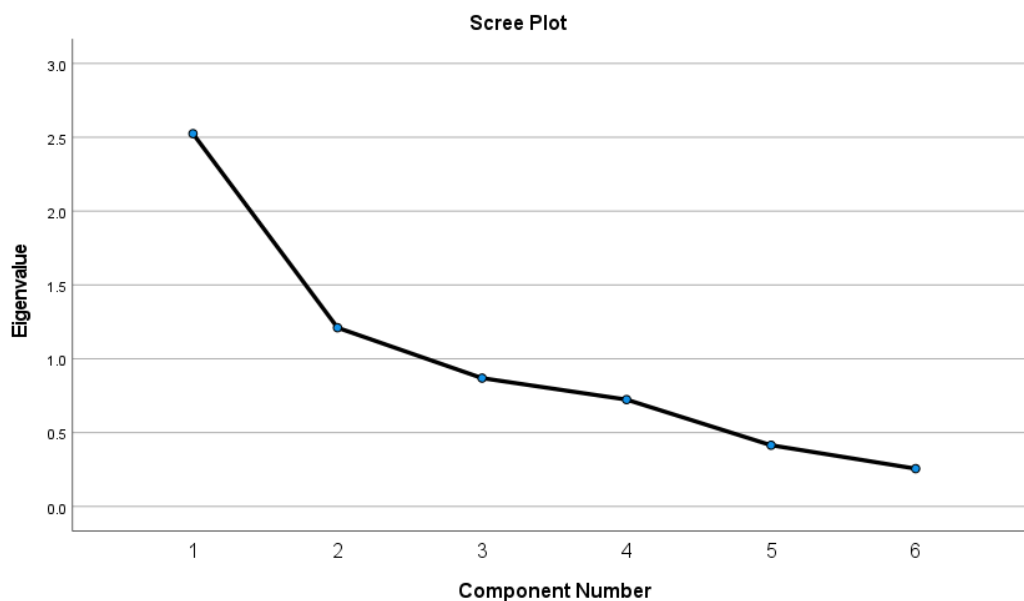
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.628
Bartlett's Test of Sphericity	Approx. Chi-Square	893.701
	Df	15
	Sig.	.000

Table 15 below shows one component with an eigenvalue of 2.525, which is confirmed by the scree plot in figure 6.

Table 16: Eigenvalue for business resources

Total Variance Explained						
Component	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.525	42.081	42.081	2.525	42.081	42.081
2	1.211	20.178	62.259	1.211	20.178	62.259
3	.869	14.491	76.749			
4	.724	12.065	88.815			
5	.415	6.914	95.728			
6	.256	4.272	100.000			

Figure 6: Business resources plot



The previous tests provide proof of the unidimensionality of the six items of business resources as they satisfy the recommended factor loading of greater than 0.21.

5.5.1.5 Technology Resources

The correlation matrix of the six items used to measure technology resources is shown in table 16 below. These items are suitable for factor analysis as indicated by correlation coefficients which are greater than 0.3.

Table 17: Correlation matrix for technology resources

		Correlation Matrix					
		TR1	TR2	TR3	TR4	TR5	TR6
Correlation	TR1	1.000	.447	.467	.563	.654	.555
	TR2	.447	1.000	.609	.698	.530	.529
	TR3	.467	.609	1.000	.659	.621	.629
	TR4	.563	.698	.659	1.000	.759	.734
	TR5	.654	.530	.621	.759	1.000	.846
	TR6	.555	.529	.629	.734	.846	1.000

The KMO value of the technology resources construct is 0.864 as shown in table 17 below which is above the cut-off point. Bartlett's test of sphericity is also highly significant ($p < .001$). The data was therefore deemed suitable for factor analysis.

Table 18: KMO and Bartlett's Test for technology resources

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.864
Bartlett's Test of Sphericity	Approx. Chi-Square	236
		5.77
		1
	Df	15
	Sig.	.000

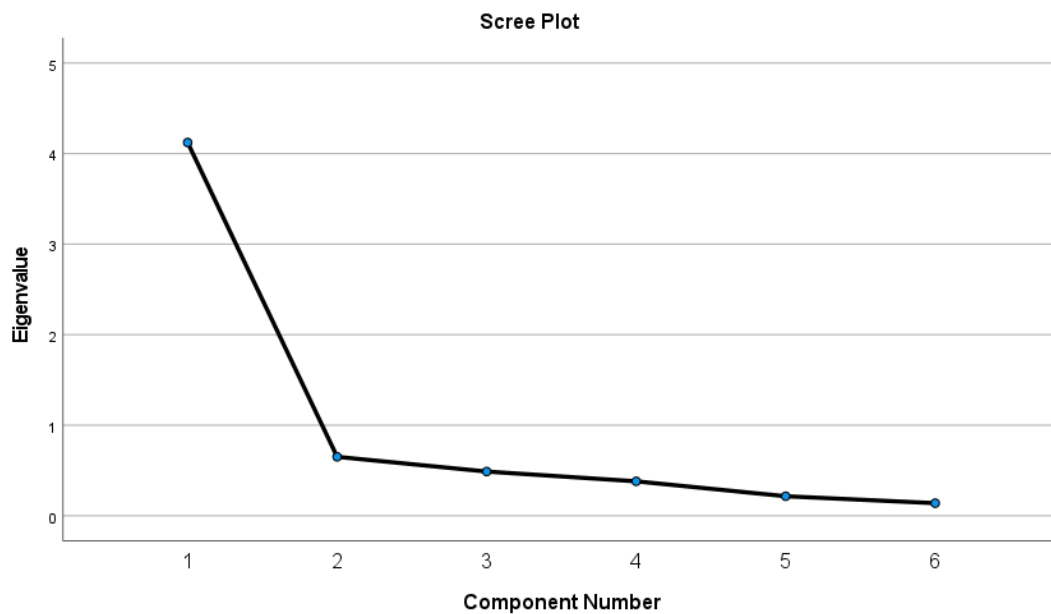
Table 18 below shows one component with an eigenvalue of 3.757, which is confirmed by the scree plot in figure 7.

Table 19: Eigenvalue for technology resources

Total Variance Explained		
Component	Initial Eigenvalues	Extraction Sums of Squared Loadings

	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.123	68.715	68.715	4.123	68.715	68.715
2	.651	10.858	79.573	.651	10.858	79.573
3	.489	8.148	87.721			
4	.381	6.350	94.071			
5	.216	3.603	97.674			
6	.140	2.326	100.000			

Figure 7: Technology resources plot



The previous tests provide proof of the unidimensionality of the six items of technology resources as they satisfy the recommended factor loading of greater than 0.21.

5.5.1.6 Commitment

The correlation matrix of the five items used to measure commitment is shown in table 19 below.

These items are suitable for factor analysis as indicated by correlation coefficients which are greater than 0.3.

Table 20: Correlation matrix for commitment

Correlation Matrix						
		C1	C2	C3	C4	C5
Correlation	C1	1.000	.692	.466	.380	.246
	C2	.692	1.000	.600	.507	.274

	C3	.466	.600	1.000	.686	.500
	C4	.380	.507	.686	1.000	.606
	C5	.246	.274	.500	.606	1.000

The KMO value of the commitment construct is 0.756 as shown in table 20 below which is above the cut-off point. Bartlett's test of sphericity is also highly significant ($p < .001$). The data was therefore deemed suitable for factor analysis.

Table 21: KMO and Bartlett's Test for commitment

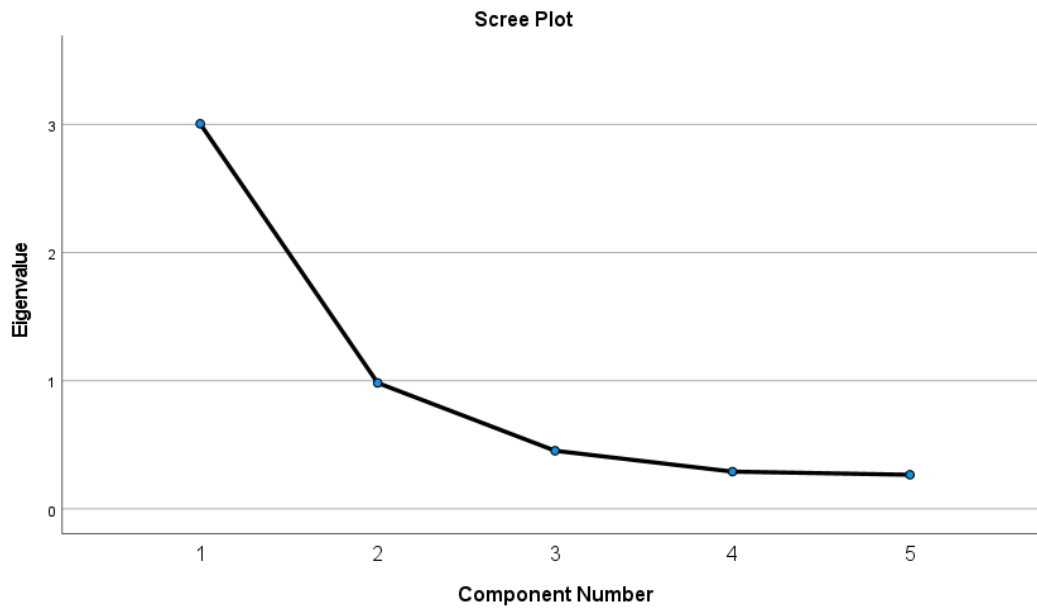
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.756
Bartlett's Test of Sphericity	Approx. Chi-Square	1277.925
	Df	10
	Sig.	.000

Table 21 below shows one component with an eigenvalue of 3.006, which is confirmed by the scree plot in figure 8.

Table 22: Eigenvalue for commitment

Total Variance Explained						
Component	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.006	60.112	60.112	3.006	60.112	60.112
2	.983	19.665	79.776	.983	19.665	79.776
3	.454	9.077	88.853			
4	.291	5.819	94.672			
5	.266	5.328	100.000			

Figure 8: Commitment plot



The previous tests provide proof of the unidimensionality of the five items of commitment as they satisfy the recommended factor loading of greater than 0.21.

5.5.1.7 Governance

The correlation matrix of the seven items used to measure governance is shown in table 22 below. These items are suitable for factor analysis as indicated by correlation coefficients which are greater than 0.3.

Table 23: Correlation matrix for governance

		Correlation Matrix						
		G1	G2	G3	G4	G5	G6	G7
Correlation	G1	1.000	.599	.769	.434	.685	.713	.607
	G2	.599	1.000	.537	.632	.457	.608	.505
	G3	.769	.537	1.000	.396	.694	.738	.612
	G4	.434	.632	.396	1.000	.404	.487	.394
	G5	.685	.457	.694	.404	1.000	.745	.696
	G6	.713	.608	.738	.487	.745	1.000	.719
	G7	.607	.505	.612	.394	.696	.719	1.000
	G8	.257	.401	.204	.506	.313	.223	.305
	G9	.500	.291	.517	.242	.541	.549	.448

The KMO value of the governance construct is 0.894 as shown in table 23 below which is above the cut-off point. Bartlett's test of sphericity is also highly significant ($p < .001$). The data was therefore deemed suitable for factor analysis.

Table 24: KMO and Bartlett's Test for governance

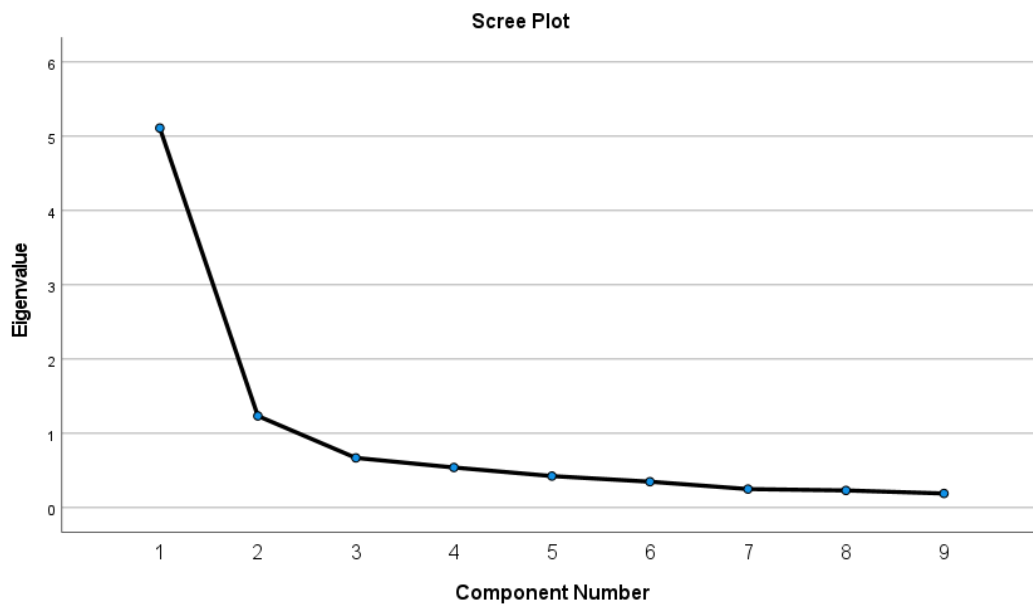
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.894
Bartlett's Test of Sphericity	Approx. Chi-Square	3149.818
	Df	36
	Sig.	.000

Table 24 below shows one component with an eigenvalue of 5.111, which is confirmed by the scree plot in figure 9.

Table 25: Eigenvalue for governance

Total Variance Explained						
Component	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.111	56.785	56.785	5.111	56.785	56.785
2	1.234	13.714	70.499	1.234	13.714	70.499
3	.669	7.437	77.936			
4	.540	6.003	83.939			
5	.425	4.719	88.658			
6	.349	3.879	92.537			
7	.250	2.776	95.313			
8	.231	2.570	97.883			
9	.191	2.117	100.000			

Figure 9: Governance plot



The previous tests provide proof of the unidimensionality of the seven items of governance as they satisfy the recommended factor loading of greater than 0.21.

5.5.1.8 Government eReadiness

The correlation matrix of the four items used to measure government eReadiness is shown in table 25 below. These items are suitable for factor analysis as indicated by correlation coefficients which are greater than 0.3.

Table 26: Correlation matrix for government eReadiness

Correlation Matrix					
		GVer1	GVer2	GVer3	GVer4
Correlation	GVer1	1.000	.782	.677	.438
	GVer2	.782	1.000	.575	.442
	GVer3	.677	.575	1.000	.346
	GVer4	.438	.442	.346	1.000

The KMO value of the government eReadiness construct is 0.753 as shown in table 26 below which is above the cut-off point. Bartlett's test of sphericity is also highly significant ($p < .001$). The data was therefore deemed suitable for factor analysis.

Table 27: KMO and Bartlett's Test for government eReadiness

KMO and Bartlett's Test	
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.753

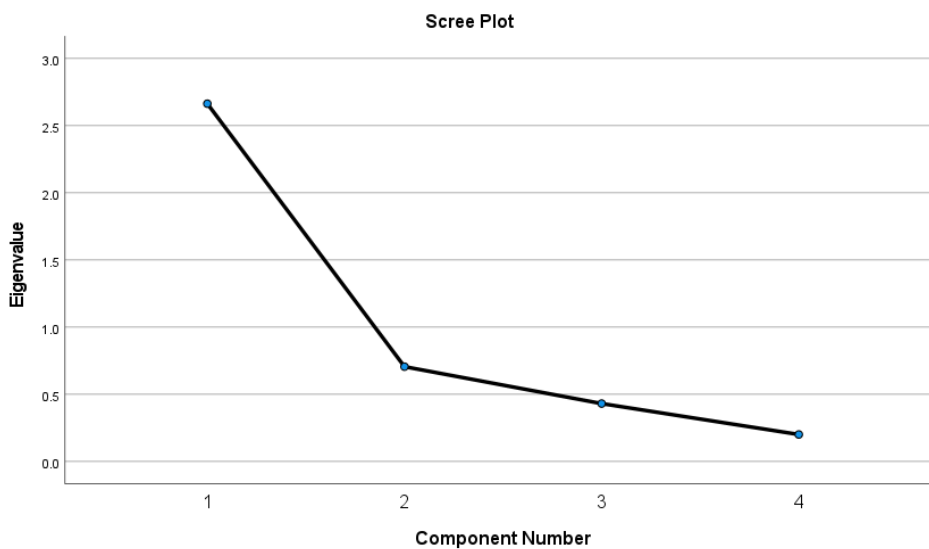
Bartlett's Test of Sphericity	Approx. Chi-Square	1024.787
	Df	6
	Sig.	.000

Table 27 below shows one component with an eigenvalue of 2.663, which is confirmed by the scree plot in figure 10.

Table 28: Eigenvalue for government eReadiness

Total Variance Explained						
Component	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.663	66.577	66.577	2.663	66.577	66.577
2	.705	17.637	84.214	.705	17.637	84.214
3	.431	10.768	94.982			
4	.201	5.018	100.000			

Figure 10: Government eReadiness plot



The previous tests provide proof of the unidimensionality of the six items of government eReadiness as they satisfy the recommended factor loading of greater than 0.21.

5.5.1.9 Supporting Industries eReadiness

The correlation matrix of the three items used to measure supporting industries' eReadiness is shown in table 28 below. These items are suitable for factor analysis as indicated by correlation coefficients which are greater than 0.3.

Table 29: Correlation matrix for supporting industries' eReadiness

Correlation Matrix				
		SIeR1	SIeR2	SIeR3
Correlation	SIeR1	1.000	.429	.318
	SIeR2	.429	1.000	.736
	SIeR3	.318	.736	1.000

The KMO value of the supporting industries eReadiness construct is 0.587 as shown in table 29 below which is above the cut-off point. Bartlett's test of sphericity is also highly significant ($p < .001$). The data was therefore deemed suitable for factor analysis.

Table 30: KMO and Bartlett's Test for supporting industries' eReadiness

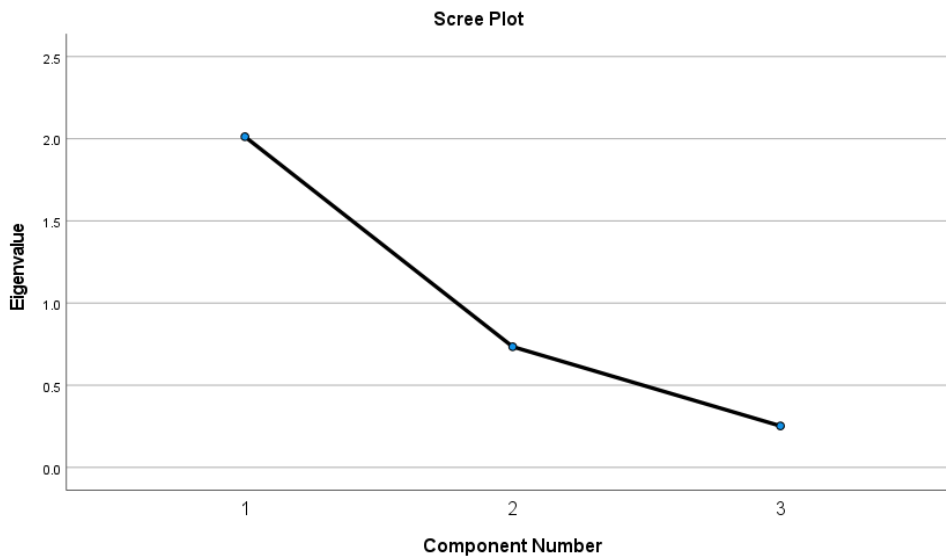
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.587
Bartlett's Test of Sphericity	Approx. Chi-Square	556.422
	Df	3
	Sig.	.000

Table 30 below shows one component with an eigenvalue of 2.013, which is confirmed by the scree plot in figure 11.

Table 31: Eigenvalue for supporting industries eReadiness

Total Variance Explained						
Component	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.013	67.089	67.089	2.013	67.089	67.089
2	.735	24.488	91.577	.735	24.488	91.577
3	.253	8.423	100.000			

Figure 11: Supporting industries plot



The previous tests provide proof of the unidimensionality of the three items of supporting industries eReadiness as they satisfy the recommended factor loading of greater than 0.21.

5.5.1.10 Proposed Research Model Analysis

Table 31 below shows the correlation matrix for the eleven variables used in this study to determine eCommerce adoption. All the correlation coefficients meet the cut-off point suggested by (Schober and Schwarte, 2018) of being greater than 0.3. Thus, the measurement variables were considered suitable for factor analysis.

Table 32: Correlation matrix for the proposed model

		Correlation Matrix			
		Background	Knowledge Flows	Network	Awareness
Correlation	Background	1.000	.402	-.143	.362
	Knowledge Flows	.402	1.000	-.096	.387
	Network	-.143	-.096	1.000	.283
	Awareness	.362	.387	.283	1.000
	Human Resources	.428	.486	-.080	.401
	Business Resources	.152	.215	.354	.473
	Technological Resources	.488	.573	-.169	.409
	Commitment	.354	.525	.067	.538
	Governance	.449	.555	.043	.539
	Market Forces eReadiness	.344	.432	-.235	.273
	Government eReadiness	.286	.316	-.389	.130
	Supporting Industries eReadiness	.319	.473	-.281	.306

		Correlation Matrix			
		Human Resources	Business Resources	Technological Resources	Commitment
Correlation	Background	.428	.152	.488	.354
	Knowledge Flows	.486	.215	.573	.525
	Network	-.080	.354	-.169	.067
	Awareness	.401	.473	.409	.538
	Human Resources	1.000	.218	.587	.499
	Business Resources	.218	1.000	.276	.420
	Technological Resources	.587	.276	1.000	.688
	Commitment	.499	.420	.688	1.000
	Governance	.560	.412	.684	.792
	Market Forces eReadiness	.376	.034	.604	.433
	Government eReadiness	.312	-.053	.433	.290
	Supporting Industries eReadiness	.442	.151	.593	.471

		Correlation Matrix			
		Governance	Market Forces eReadiness	Government eReadiness	Supporting Industries eReadiness
Correlation	Background	.449	.344	.286	.319
	Knowledge Flows	.555	.432	.316	.473
	Network	.043	-.235	-.389	-.281
	Awareness	.539	.273	.130	.306
	Human Resources	.560	.376	.312	.442
	Business Resources	.412	.034	-.053	.151
	Technological Resources	.684	.604	.433	.593
	Commitment	.792	.433	.290	.471
	Governance	1.000	.535	.347	.511
	Market Forces eReadiness	.535	1.000	.689	.543
	Government eReadiness	.347	.689	1.000	.550
	Supporting Industries eReadiness	.511	.543	.550	1.000

Additional analysis to determine the suitability of the data set for factor analysis was conducted by calculating the Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity. (Field, 2009) suggests a cut-off KMO value of greater than 0.5. Table 32 below shows a

KMO value of 0.877 and a highly significant Bartlett's test of sphericity ($p < .001$). All these statistics point to the data being appropriate for factor analysis.

Table 33: KMO and Bartlett's Test for the proposed model

KMO and Bartlett's Test

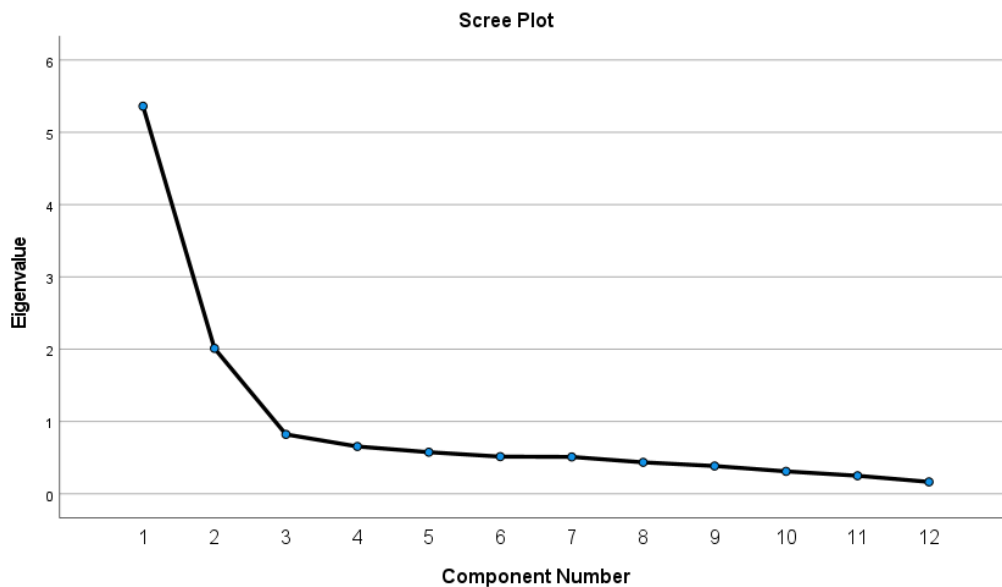
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.877
Bartlett's Test of Sphericity	Approx. Chi-Square	3523.845
	Df	66
	Sig.	.000

The Eigenvalue was computed to determine the number of components in the scale and the scree plot was graphed. Table 33 below shows the eigenvalue of the knowledge flows construct. Similarly, figure 12 shows the scree plot of the proposed model.

Table 34: Eigenvalue for the proposed research model

Total Variance Explained						
Component	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.362	44.684	44.684	5.362	44.684	44.684
2	2.012	16.771	61.455	2.012	16.771	61.455
3	.822	6.852	68.307			
4	.655	5.459	73.766			
5	.576	4.799	78.565			
6	.515	4.290	82.856			
7	.511	4.255	87.110			
8	.436	3.631	90.741			
9	.385	3.208	93.949			
10	.311	2.590	96.539			
11	.250	2.084	98.623			

Figure 12: Scree Plot for the proposed research model



The factor loading of scale items was then computed. This study follows the factor loading of greater than 0.2 recommended by (Field, 2009). Table 33 above shows that the factor loading for the variables exceeds the cut-off point. The previous tests indicate that all eleven variables of the proposed research model are unidimensional.

5.6.2 Confirmatory Factor Analysis

Convergent validity was tested to determine whether all items within the scale measure the variable they purport to measure, and discriminant validity was measured to ascertain that the variables defined for the PERM are truly distinct from one another. A correlation matrix approach in SPSS27 was used. By observing the degree to which the correlations differ significantly from zero and are large enough to justify further investigation of discriminant validity, the validity diagonal provides evidence of convergent validity (Appendix E). The lowest intra-factor correlation for each factor was background 0.23, knowledge flow 0.30, networks 0.29, aAwareness0.22, human resources 0.36, business resources 0.33., technology resources 0.37, commitment 0.4, governance 0.35, market forces eReadiness 0.47, government eReadiness 0.60, and supporting industries eReadiness 0.48. Correlations above zero are statistically significant and sufficient for discriminant validity analysis to proceed.

According to (Molla and Heeks, 2007) an item correlating more strongly with other items of the same variable than with items of other variables indicates discriminant validity. The minimum value of correlation was compared with each of the other variables and evaluated with the number of violations where the correlation is lesser to establish discriminant validity. The minimum item-factor

correlation for KNWFLO was 0.30 and is higher than KNWFLO's correlation with items of the other variable NET within the Knowledge construct. Thus, both the convergent and divergent validity of the measurement scale was established. These tests show that quality data can be generated from the measurement scale.

5.7. Test of Model Fit

IBM SPSS Amos 26 was used to determine how well the model fit the data. The model fit statistics in this study were acceptable following suggestions by (Byrne, 2010; Barnidge and Zúñiga, 2017) with a Tucker-Lewis coefficient of 0.717 and a root mean square error of approximation (RMSEA) of 0.151. (Byrne, 1994) proposes the assessment of a comparative fit index (CFI) when adding constructs to a model. The CFI value of this model is acceptable at 0.822. Table 34 below shows a summary of the goodness of fit statistics.

Table 35: Goodness of fit statistics

Measure	Estimate	Suggested	Conclusion
Tucker-Lewis coefficient (TLI)	0.717	>0.9	Acceptable
Comparative fit index (CFI)	0.822	>0.9	Good
Root mean square error of approximation (RMSEA)	0.151	0.08 – 0.10	Good

5.8. Test of Structural Model

The structural model in this study was tested using structural equation modelling with IBM AMOS 26. The first criterion is the degree to which the model explains the variance in the dependent variable. The second is the significance of the path coefficients.

5.8.1. Variance Explained

To determine whether the model adequately explains changes in the dependent variable, R-squared values were computed to establish the variance in the dependent variable that the independent variables explain collectively. According to (Frost, no date), R-squared measures the strength of the relationship between the model and the dependent variable on a 0 – 100% scale. Table 36 below shows the R² values. Knowledge flows explains 51% of the variance in eCommerce adoption while government eReadiness explains 58% of the variance in eCommerce adoption. Market forces eReadiness (71%), governance (79%), and commitment (73%) explained the highest variance in eCommerce adoption, followed by technology resources at 66%. Only 17% of the variance in eCommerce adoption was explained by business resources. Human resources explained 42% of the variance in eCommerce adoption. 35% of the variance in eCommerce adoption was explained by

awareness. Similarly, 35% of the variance in eCommerce adoption is attributed to networks. Finally, knowledge flows explained 40% of eCommerce adoption.

Table 36: R-square values

Construct	R²
Supporting Industries eReadiness	.510
Government eReadiness	.589
Market Forces eReadiness	.713
Governance	.790
Commitment	.736
Technology Resources	.660
Business Resources	.175
Human Resources	.424
Awareness	.358
Networks	.035
Knowledge Flows	.402

5.8.2. Path Analysis

The significance of the path coefficients was calculated using regression analysis. Table 36 below shows the results of the path analysis conducted using IBM SPSS Amos 26. (Alanazi, 2013) suggests that a regression beta value is highly significant at $p < .001$, significant at $p < .01$, and moderately significant at $p < .05$. The results show that all path coefficients were significant.

Table 37: Path coefficients

			Estimate	S.E.	C.R.	P	Label
Knowledge Flows	<--- knowledge		1.000				
Networks	<--- knowledge		.840	.198	4.248	***	par_1
Awareness	<--- POER		1.000				
Human Resources	<--- POER		.414	.032	12.791	***	par_2
Business Resources	<--- POER		.469	.048	9.701	***	par_3
Technology Resources	<--- POER		1.326	.088	14.986	***	par_4
Commitment	<--- POER		1.162	.072	16.170	***	par_5
Governance	<--- POER		1.968	.120	16.371	***	par_6
Market Forces eReadiness	<--- PEER		1.000				
Government eReadiness	<--- PEER		1.909	.115	16.625	***	par_7
Supporting Industries eReadiness	<--- PEER		.977	.065	14.980	***	par_8
ECOMMERCE ADOPTION	<--- knowledge		.370	.199	1.855	***	par_9

		Estimate	S.E.	C.R.	P	Label
ECOMMERCE ADOPTION	<--- POER	.087	.007	11.882	***	par_10
ECOMMERCE ADOPTION	<--- PEER	.019	.011	1.703	***	par_11

5.9. Predictive Validity

Predictive validity was assessed using Python to determine whether the instrument can differentiate between non-adopters, initial adopters, and SMEs with more advanced eCommerce use. The predictive power of the constructs was assessed based on correlations between the developed scales and the control variables.

Table 38: Predictive power analysis using multinomial logistic regression

Classification				
Observed	Predicted			
	Non-Adopter	Initial Adopter	Institutional Adopter	Percent Correct
Non-Adopter	440	18	7	94.6%
Initial Adopter	35	38	8	46.9%
Institutional Adopter	12	5	29	63.0%
Overall Percentage	82.3%	10.3%	7.4%	85.6%

Table 37 shows the classification statistics used to determine the degree to which the model predicted the different eCommerce adoption levels. Non-adopters were correctly predicted by the model 94.6% of the time as 440 out of the 465 SMEs who did not adopt eCommerce were correctly predicted to do so by the model; $[440 / (440 + 18 + 7) = .946]$. Initial adopters were correctly predicted by the model 46.9% of the time. Institutional adopters were correctly predicted 63.0% of the time. Overall, the model did a particularly good job of predicting eCommerce uptake by SMEs at a rate of 85.6%.

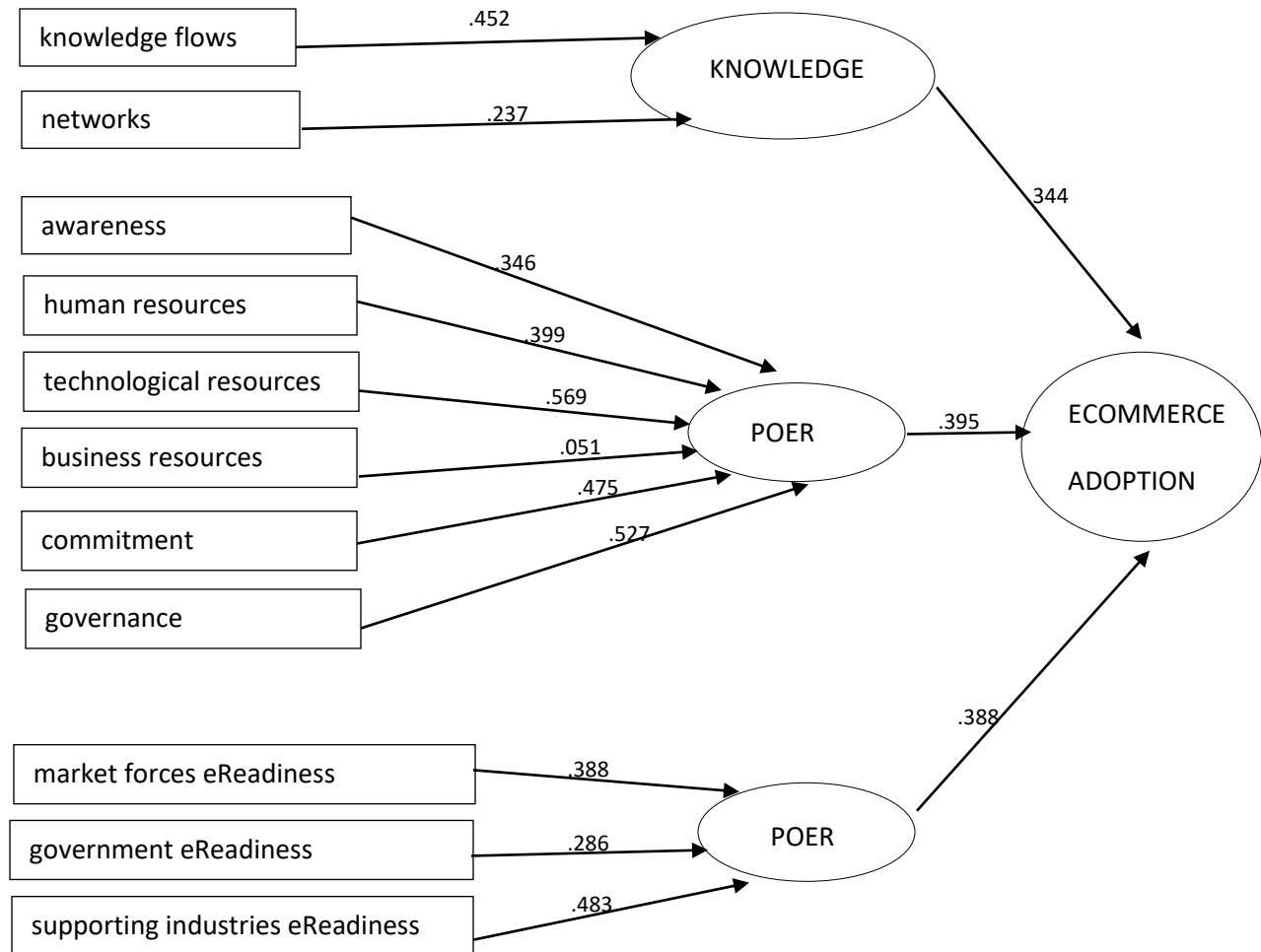
All correlations between the knowledge eReadiness, organizational eReadiness, and external eReadiness main research constructs and their respective control variables showed evidence of predictive validity at the 0.5 significance level.

5.10. Impact of Factors

The Pearson correlation coefficient was calculated using SPSS27 to determine the size of an effect. According to (Field, 2009), values from .1 to .3 represent a small effect, .3 to .5 signify a medium effect, while .5 to 1.0 is a large effect. Technological resources, governance, supporting industries

eReadiness, commitment, and knowledge flows had the highest level of impact on eCommerce adoption by Botswana SMEs. Figure 13 below shows the correlation coefficients.

Figure 13: Path correlation coefficients



5.11. Hypotheses Testing

The 5 research hypotheses were tested based on the Pearson correlations illustrated above.

Hypothesis H₁: There is a positive relationship between knowledge flows in the NIS and the extent of the eCommerce knowledge of SME managers.

This hypothesis was supported as indicated by the significant positive relationship between the knowledge flow variable and the knowledge construct.

The chi-square test also confirms this hypothesis as shown in table 39 below.

Table 39: Chi-square test of the relationship between knowledge flow and eCommerce adoption

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	166.133 ^a	12	.261
Likelihood Ratio	163.510	12	.230
Linear-by-Linear Association	128.385	1	.151
N of Valid Cases	596		

Hypothesis H₂: There is a positive relationship between the network of institutions in the NIS and the extent of the eCommerce knowledge of SME managers.

This hypothesis was supported as indicated by the significant relationship between networks and knowledge.

The chi-square test also confirms this hypothesis as shown in table 40 below.

Table 40: chi square test for the relationship between network and eCommerce adoption

Chi-Square Tests

	Value	Df	Asymptotic Significance (2- sided)
Pearson Chi-Square	115.889 ^a	19	.093
Likelihood Ratio	111.698	19	.211
Linear-by-Linear Association	47.738	1	.273
N of Valid Cases	596		

Hypothesis H₃: There is a positive relationship between knowledge and chi-square eCommerce adoption.

This hypothesis was supported as indicated by the significant relationship between knowledge and eCommerce adoption.

The chi square test also showed knowledge was positively related to eCommerce adoption as shown in table 41 below.

Table 41: chi-square test of the relationship between knowledge and eCommerce adoption

Chi-Square Tests

	Value	Df	Asymptotic Significance (2- sided)
Pearson Chi-Square	351.501 ^a	76	.651
Likelihood Ratio	370.508	76	.155
Linear-by-Linear Association	192.621	1	.180
N of Valid Cases	594		

Hypothesis H₄: There is a positive relationship between internal organizational eReadiness factors and eCommerce adoption.

This hypothesis was supported as indicated by the significant relationship between internal organizational eReadiness factors and eCommerce adoption.

The chi-square test also confirmed this hypothesis as shown in table 42 below.

Table 42: chi square test of the relationship between POER factors and eCommerce adoption

Chi-Square Tests

	Value	Df	Asymptotic Significance (2- sided)
Pearson Chi-Square	351.501 ^a	76	.131
Likelihood Ratio	370.508	76	.287
Linear-by-Linear Association	192.621	1	.201
N of Valid Cases	594		

Hypothesis H₅: There is a positive relationship between external eReadiness factors and eCommerce adoption.

This hypothesis was supported as indicated by the significant relationship between eternal eReadiness factors and eCommerce adoption.

The chi-square test confirmed this hypothesis as shown in table 43 below.

Table 43: chi-square test of the relationship between PEER factors and eCommerce adoption

Chi-Square Tests

	Value	Df	Asymptotic Significance (2- sided)
Pearson Chi-Square	176.064 ^a	25	.089
Likelihood Ratio	176.682	25	.133
Linear-by-Linear Association	91.211	1	.152
N of Valid Cases	595		

5.12. Summary

This chapter presents the demographic analysis of the factors that affect the eReadiness of SMEs for eCommerce adoption. The reliability and validity test results are reported. The test of model fit was also presented, followed by a test of the structural model, as well as the path coefficient test. Finally, an assessment of the impact of factors on eCommerce adoption and a test of the hypothesis was presented.

CHAPTER 6: DISCUSSION

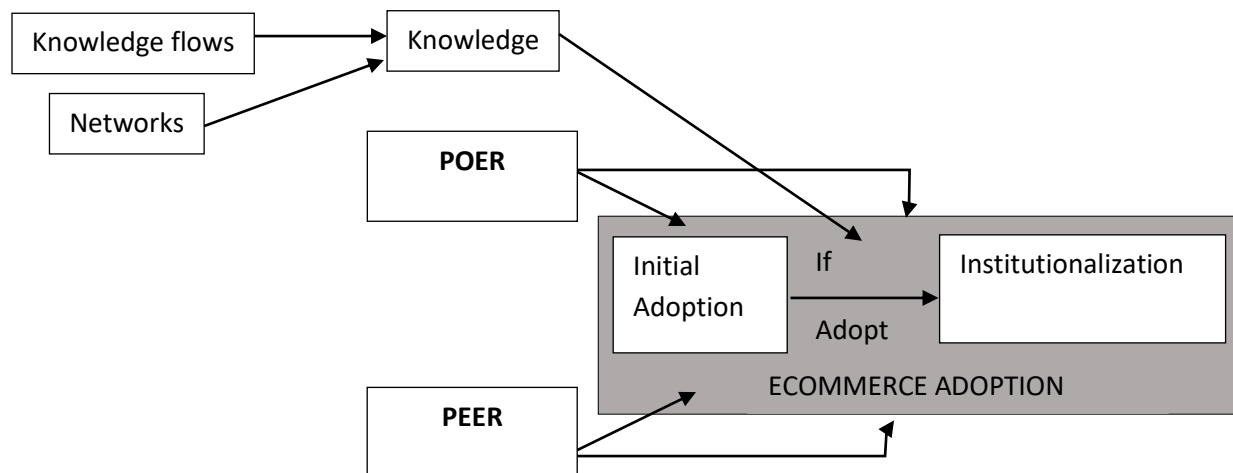
6.1 Introduction

This chapter provides a discussion of the key findings of the qualitative survey research presented in chapter 5 above. The research objective and questions of the study are addressed by utilising the exploratory power of the theoretical constructs of an extended PERM. The results from the statistical analysis are discussed in this chapter based on the research model.

6.2 The Role of the Extended PERM on eCommerce Adoption

(Molla and Licker, 2005) posit that perceived POER factors and PEER factors combine to determine the eReadiness for eCommerce adoption in developing countries. This study extended the PERM by establishing the relationship between knowledge and eCommerce adoption through a review of IS use and NIS literature. (Zygiaris, 2021) established a direct and positive link between national innovation systems and eCommerce capacity. Similarly, (Hardilawati, Binangkit and Sandri, 2019) found that the national innovation system in Indonesia plays a critical role in the marketing performance of SMEs. This study posits that the networks among innovation actors and the knowledge flows amongst them are key determinant factors of eCommerce adoption by SMEs in developing countries. Figure 5 below shows the extended PERM.

Figure 14: Extended PERM



6.2.1 Knowledge

The proposed research model posits that there is a direct and positive relationship between knowledge variables and eCommerce adoption. The statistical analysis (Section 5.10) confirms this hypothesis. The results presented in Chapter 5 above indicate that knowledge flows have a positive and direct impact on eCommerce adoption. Similarly, as shown in figure 14 above the networks among innovation actors showed a correlation of .237 significant at the 0.001 level. SMEs with institutional support and access to the eCommerce knowledge base are therefore more likely to adopt eCommerce

and further invest in sophisticated eCommerce technology. This finding is consistent with previous literature. According to the (OECD, 2017), globalization has increased the demand for international collaboration in obtaining foreign inputs for innovation including ideas, finance, skills, and technologies, and exporting local outputs such as products and services, patents, licenses, etc. to foreign markets. However, (Chandra, 2012) suggests that some of the biggest challenges for SMEs operating in developing countries are identifying and integrating knowledge created by external stakeholders with internal practices and innovation processes, and connecting with appropriate knowledge partners and networks at the local, national, and global levels. (Bwalya, 2012) agrees that, for Botswana to position itself as a knowledge-based economy and compete on a global scale there is a need to establish efficient knowledge value chains. Thus, the networks of innovation factors and the knowledge flows amongst them as suggested by this study are key determinants of the eReadiness of SMEs in developing countries for eCommerce adoption.

According to (Zygiaris, 2021), national innovation systems establish networks that enable SMEs to collaborate and share resources with other stakeholders. They explain that these networks facilitate access to strategic resources such as skills, knowledge networks, and capital, and public investment areas such as education and training, innovation, and infrastructure which are significant factors to consider in building the capacity of SMEs for eCommerce adoption. Thus, the stronger the networks, the more SMEs will adopt eCommerce.

6.2.2 Resources

Molla and Licker (2014) identify technology, business, and resources under the POER construct. The results show that technological resources had the highest impact on eCommerce adoption by Botswana SMEs with a coefficient of .569 ($p < 0.001$). This finding is consistent with studies by (Ndayizigamiye and Khoase, 2018) who found that the cost of computers and networks is a major inhibitor of eCommerce adoption by SMMs in South Africa. Similarly, (Cloete, 2001; Kshetri, 2007; Tan, Tyler and Manica, 2007; Uzoka, Shemi and Seleka, 2007; Travica *et al.*, 2014; Villa *et al.*, 2018) point to technological factors as critical determinants of eCommerce adoption in developing countries.

Human resources showed a medium effect on eCommerce adoption by Botswana SMEs (.399). Employees with the appropriate technology skills are key to eCommerce uptake and the success of eCommerce endeavours. However, business resources revealed a negligible impact on eCommerce adoption by Botswana SMEs with a Pearson coefficient of only .051.

The NIS approach to eCommerce suggested in this study ensures that SMEs have access to more resources than what they can generate alone, resulting in significant improvement of the eReadiness of SMEs for eCommerce adoption.

6.2.3 Managerial Expertise

Molla and Licker classify governance of the business and management's commitment to eCommerce under POER in the PERM. Governance had the second-highest impact on eCommerce adoption by SMEs in Botswana with a path coefficient of .527 ($p < 0.001$). Managers' commitment to eCommerce initiatives had a medium correlation of .475.

Since eCommerce is a disruptive technology, the adoption of eCommerce technology requires skills to develop eCommerce entrepreneurs. The findings of this study are consistent with Ringberg, Reihlem, and Ryden (2019) who agree that the transformation process requires progressive managers with the will and skills to adopt innovations. However, Ghobakhloo, Arias-Aranda and Benitez-Amado, (2011) suggest that most business managers in developing countries have limited experience with conducting business electronically and as a result, they lack the requisite technological, cultural, and structural eReadiness necessary for the initial adoption and subsequent institutionalization of eCommerce. It becomes imperative for managers that seek to adopt eCommerce technology to possess the requisite knowledge and commitment to successfully manage eCommerce initiatives because the implementation of any new technology such as eCommerce requires major changes in the current practices, systems, processes, and workflows of the organisation. Access to knowledge institutions is therefore a key determinant factor of eCommerce adoption by upskilling SMEs' managers.

6.2.4 Supporting Industries' eReadiness

External pressure from stakeholders is one of the key drivers of technology innovation identified by Molla and Licker (2014). The results of this study reveal a positive correlation between supporting services and eCommerce adoption by SMEs. According to (Travica *et al.*, 2014) eCommerce adoption largely depends on supporting industries such as the availability and affordability of ICT, the institutionalization and development of the financial sector, and the availability of reliable courier and transportation facilities.

This study suggests a NIS approach to cultivating the eReadiness of SMEs for eCommerce adoption. (Molla and Licker, 2014) suggest that external pressure is low in developing countries. This can be attributed to insufficient national innovation systems. The development of innovation institutions

would advance eCommerce adoption among SMEs by availing efficient, fast, or even preferential access to eCommerce inputs.

6.3. Summary

This chapter discussed the statistical results in Chapter 5 about the research questions posed by this study. A review of the research model was presented, including a discussion of the key constructs.

CHAPTER 7: CONCLUSION

7.1 Introduction

This concluding chapter presents an overview of the research presented in this thesis, followed by research recommendations on eCommerce adoption and IS literature. A discussion of the limitations of the study is also presented, including future research directions.

7.2 Research Overview

The barriers to eCommerce adoption vary across developing countries. A useful way to identify and assess the specific factors influencing eCommerce adoption is to utilise a theoretical framework. An extended questionnaire based on (Molla and Licker, 2005) perceived eReadiness model was administered to Botswana SMEs in this study. The extended scale was designed to learn more about SMEs in Botswana's developing country context, their knowledge base, how they interact and their support institutions, and the key deterrents to eCommerce adoption. The scale was extended to map technology transfer in SMEs by reviewing both the horizontal knowledge transfer practices among networks of SMEs and vertically with larger businesses, academic research institutions, and public research organisations. The responses lead to a comprehensive understanding of the eCommerce adoption process and determinant factors.

The results of the statistical analysis provide evidence for statistically significant positive correlations among knowledge factors, perceived organisational eReadiness factors, and perceived external eReadiness factors to eCommerce adoption. It can be concluded that national innovation systems play a key role in the eReadiness of developing countries for eCommerce adoption. This critical information provides direction for policymakers and supporting agencies and the formulation of appropriate strategies by SME management in dealing with the challenges that arise during the eCommerce adoption process.

7.3 Research Contribution

Theoretical contribution: This research contributes to eCommerce adoption literature by providing a comprehensive theoretical model of eCommerce adoption for developing countries. The research model extends the PERM by introducing an additional knowledge construct. The model extension in this study is grounded in NIS theory to offer a more comprehensive and holistic understanding of the eCommerce adoption eReadiness of SMEs. The exploratory power of the revised model has been demonstrated.

The NIS approach is a neglected area of research in developing countries, particularly in eCommerce adoption literature. This study provides research references for scholars to further explore the systematic approach to eCommerce adoption.

Empirical contribution: Tan, Tyler, and Manica (2007) and Molla and Licker (2005) suggest that there is a need to further validate the PERM in other contexts. 569 questionnaires were collected from SMEs across Botswana through a survey. The data collected provides strong empirical evidence for the hypothesized relationships in examining eCommerce adoption. Further, the research provides a new empirical assessment of the relationship between knowledge and eCommerce adoption in Botswana.

Contribution to Botswana government: This study provides valuable research references and basic documentary support to policymakers interested in the development of knowledge infrastructure in developing countries. It provides an understanding of the creation of suitable conditions for the progress of SMEs in eCommerce adoption. The study also emphasizes the key role of SMEs in the NIS and recognizes them as significant contributors to the overall economic and social development of developing countries.

7.4 Research Implications

The results of this study have important implications for guiding SME managers in their development of eCommerce adoption strategies. The identification of eCommerce adoption determinant factors helps managers craft relevant strategies and direct resources toward eCommerce adoption. An assessment of the determinant eReadiness factors of eCommerce adoption enables policymakers to develop policies and initiatives towards the identified areas of strengths and weaknesses. The extended PERM as applied in this study will help developing countries develop policies that are appropriate, relevant, and implementable for the needs of developing countries' SMEs. The study helps policymakers highlight the barriers to eCommerce adoption and demonstrates how to assist SMEs to overcome them. The NIS approach applied in this study suggests that eCommerce adoption is not only incumbent on individual SMEs but is the result of different institutions working together to share knowledge and resources. Thus, developing countries' governments must invest in developing the necessary institutions and fostering a network among SMEs to develop an innovative system of eCommerce.

7.5 Recommendations of the Study

A country's national information environment is shaped by government policies, legislation, regulations, and social and cultural values which influence eCommerce adoption. The government of Botswana needs to formulate appropriate policies that facilitate the development of the regulatory environment, technology infrastructure, learning institutions, facilitation hubs, and facilitate networks between them towards increasing the rate of eCommerce adoption. The government of Botswana should invest in fostering institutional networks in their national innovation system to provide access to technological knowledge and resources to SMEs. The support of technological innovation actors would offset the characteristic limitations of SMEs towards eCommerce adoption. Following the statistical findings of this study, it is imperative for managers, policymakers, and other innovation actors to invest in business, the human, and technological resources towards increasing eCommerce adoption rates among SMEs.

7.8 Research Limitations

Due to the nature of the research questions, this study was based primarily on quantitative research methods. However, the complex nature of innovation systems may require further research using a qualitative approach to yield a more in-depth understanding of the impact of innovation factors on eCommerce adoption. The sampling in this study does not conform to the statistical random sampling norm as data was collected in areas that were easily accessible to the researcher. Thus, the generalization is limited. Administering the instrument in other more rural parts of the country may yield different results. Moreover, there is a need to test the extended PERM in other developing country contexts.

Despite these limitations, the key findings from this study from a NIS perspective provide a jumping-off point for eCommerce researchers and eCommerce policymakers in developing countries to better understand eCommerce adoption determinant factors. Understanding the limitations of this study provides direction for future research.

7.9 Future Works

This research study was conducted to provide solutions to the problem of low eCommerce adoption among Botswana SMEs. The research can also apply to other developing countries. Application of the research model developed in this study in different developing countries is imperative to further validate the model. Future research can also focus on the factors that influence eCommerce institutionalization by developing countries' SMEs. Institutionalization is critical for businesses to get the full benefits of eCommerce. Additionally, the adoption behaviours of SMEs may vary

considerably because of changes brought on by Covid-19. Therefore, further comparative research with comparisons made to the pre-Coronavirus findings would be desirable.

7.10 Summary

This study makes significant contributions to eCommerce adoption research. This study investigated the key determinant factors of eCommerce adoption by SMEs in developing countries. The research extended the perceived eReadiness model to include a knowledge construct based on the national innovation system approach to technological innovation. The result of this research study can serve as a foundation for future research on eCommerce adoption and use. Additionally, the results of this research provide a guideline for managers, policymakers, and other technological innovation actors in formulating eCommerce adoption strategies and policies. The results of this study highlight the critical role of knowledge in eCommerce and how a systematic approach can promote eCommerce adoption among SMEs.

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APPENDIX A: QUESTIONNAIRE

The adoption of eCommerce in Botswana SMEs: an analytical framework

This study responds to a need to know more about the ways Botswana businesses use the Internet. This part of the study draws on the knowledge and experience of business managers in Botswana.

What is eCommerce?

For the purposes of this study, eCommerce refers to any business transactions conducted over the internet such as email, payments, communication etc.

Your participation is voluntary and you are free to withdraw from the study. The ways that your identity is protected are as follows:

- Your identity will not be revealed.
- The location of your business will not be revealed. This will be achieved through the use of pseudonyms (made-up names) for business names.

The questionnaire should take about 30 minutes to complete. Please be as accurate as you can but remember that an approximate answer is still valuable for the study. If you don't want to answer a question for any reason, you are not required to do so

Finally, if you have any questions or complaints about this research you may contact Dr Malatsi Galani (Ph: +267 498 1106; email: galanim@biust.ac.bw) or Dr William Tibben (Ph: +61 2 4221 3768; email: wjt@uow.edu.au).

You can also contact the Human Research Ethics Committee at the University of Wollongong (Ph: +61 2 4221 4457) or BIUST (Ph: +267 493 1222).

Consent Form

I give my consent to use the information I supply to this study on the understanding that:

- I will be asked to complete a questionnaire that will take about 30 minutes to complete.
- The information will only be used for the purposes outlined in the study leaflet entitled:
The adoption of eCommerce in Botswana SMEs: an analytical framework
- Reports and publication from the study will be based on de-identified information and will not identify businesses and individuals taking part.
- My participation is entirely voluntary. I am free to withdraw from the study at any time.
- My decision on whether or not to take part in this study will not disadvantage me or affect my involvement with the Botswana International University of Science and Technology and the University of Wollongong.

I have been provided with information about this study including how it will gather, store use and disclose information about me. I have been given an opportunity to ask questions and have been fully informed.

☐ - Accept. Please turn the page to begin the questionnaire.

I. ****Background**

B1. Which industry does your company fall in?

1. Services ()
2. Goods ()

B2. How many employees does your company have?

1. Less than 25 ()
2. 25-50 ()
3. 50-100 ()

B3. What is their general educational background?

1. BGCSE ()
2. Undergraduate ()
3. Higher than undergraduate ()

B4. Your organization has permanent IT staff in-house

Yes No Occasionally (as needed only)

II. ***Knowledge flows**

KNW1. The following eCommerce information sources are easily accessible to our organization: (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree)

	Information source	1	2	3	4	5
Internal	Within your organization					
Market sources	Suppliers of IT software and hardware					
	Clients or customers from the private sector					
	Clients or customers from the public sector					
	Competitors or other enterprises in your industry					
	Consultants					
Education & research institutes	Universities or other higher education institutions					
	Government, public, or private research institutes					
Other sources	Conferences, trade fairs, exhibitions					
	Scientific journals and technical publications					
	Professional and industry associations					

III. ***Networks**

NET1. Our organization is willing to cooperate with other enterprises on eCommerce initiatives.

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

NET2. The following strategies are important for reaching our enterprise's goals: (1 = strongly agree, 2 = agree, 3 = neutral, 4 = disagree, 5 = strongly disagree)

	Importance				
	1	2	3	4	5
Developing new markets within Botswana					
Developing new markets outside					
Reducing in-house costs of operation					
Intensifying or improving the marketing of goods and services					
Increasing flexibility/responsiveness of your organization					
Building alliances with other enterprises or institutions					

Please indicate your level of agreement with each of the following statements.

IV. Awareness

A1. Our organization is aware of eCommerce implementations of our partner organizations

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

A2. Our organization is aware of our competitors' eCommerce and e-business implementations

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

A3. Our business recognizes the opportunities and threats enabled by eCommerce

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

A4. Our organization understands eCommerce business models that can be applicable to our business

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

A5. We understand the potential benefits of eCommerce to our business

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

A6. Our organization has thought about whether or not eCommerce has impacts on the way business is to be conducted in our industry

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

A7. Our organization has considered whether or not businesses in our industry that fail to adopt eCommerce and e-business would be at a competitive disadvantage

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

V. Human Resources

HR1. Most of our employees are computer literate

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

HR2. Most of our employees have unrestricted access to computers

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

VI. Business Resources

BR1. Our people are open and trusting with one another

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

BR2. Communication is very open in our organization

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

BR3. Our organization exhibits a culture of enterprise wide information sharing

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

BR4. We have a policy that encourages grass roots eCommerce initiatives

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

BR5. Failure can be tolerated in our organization

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

BR6. Our organization is capable of dealing with rapid changes

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

VII. Technological Resources

TR1. We have sufficient experience with network-based applications

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

TR2. We have sufficient business resources to implement eCommerce

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

TR3. Our organization is well computerized with LAN and WAN

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

TR4. We have high bandwidth connectivity to the Internet

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

TR5. Our existing systems are flexible

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

TR6. Our existing systems are customizable to our customers' needs

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

VIII. Commitment

C1. Our business has a clear vision on eCommerce

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

C2. Our vision of eCommerce activities is widely communicated and understood throughout our company

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

C3. Our eCommerce implementations are strategy-led

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

C4. All our eCommerce initiatives have champions

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

C5. Senior management champions our eCommerce initiatives and implementations

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

IX. Governance

G1. Roles, responsibilities and accountability are clearly defined within each eCommerce initiative

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

G2. eCommerce accountability is extracted via on-going responsibility

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

G3. Decision-making authority has been clearly assigned for all eCommerce initiatives

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

G4. We thoroughly analyse the possible changes to be caused in our organization, suppliers, partners, and customers as a result of each eCommerce implementation

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

G5. We follow a systematic process for managing change issues as a result of eCommerce implementations

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

G6. We define a business case for each eCommerce implementation or initiative

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

G7. We have clearly defined metrics for assessing the impact of our eCommerce initiatives

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

G7. Our employees at all levels support our eCommerce initiatives

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

G8. We believe that our customers are ready to do business on the Internet

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

X. Market Forces eReadiness

MFeR1. We believe that our business partners are ready to conduct business on the Internet

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

MFeR2. We believe that there are effective laws to protect consumer privacy

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

XI. Government eReadiness

GVer1. We believe that there are effective laws to combat cyber crime

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

GVer2. We believe that the legal environment is conducive to conduct business on the Internet

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

GVer3. The government demonstrates strong commitment to promote eCommerce

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

GVer4. The telecommunication infrastructure is reliable and efficient to support eCommerce and eBusiness

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

XII. Supporting Industries eReadiness

SleR1. The technology infrastructure of commercial and financial institutions is capable of supporting eCommerce transactions

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

SleR2. We feel that there is efficient and affordable support from the local IT industry to support our move on the Internet

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

SleR3. Secure electronic transaction (SET) and/or secure electronic commerce environment (SCCE) services are easily available and affordable

☐ 1. Strongly Agree ☐ 2. Agree ☐ 3. Neutral ☐ 4. Disagree ☐ 5. Strongly Disagree

Please choose only one option

XIII. eCommerce Adoption

AED1. Which one of the following best describes your current eCommerce status?

- ☐ Not connected to the Internet, no e-mail.
- ☐ Connected to the Internet with e-mail but no web site
- ☐ Static Web, that is publishing basic company information on the web without any interactivity
- ☐ Interactive web presence that is accepting queries, e-mail; and form entry from users
- ☐ Trans active web, that is online selling and purchasing of products and services including customer service
- ☐ Integrated web, that is the web site is integrated with suppliers, customers and other back office systems allowing most of the business transactions to be conducted electronically

This is the end of the survey.

Thank you for taking the time to assist with this research.

Please indicate company name.

Have you signed the consent form?

APPENDIX B: INFORMATION SHEET

Small and medium enterprises in developing countries' national innovation systems: investigating the determinant factors to eCommerce adoption

What is this study of eCommerce in Botswana all about?

This study aims to assist business owners, policy makers and academics to develop better strategies to develop their businesses using the Internet. This survey provides a benchmark for comparison over time, and with other countries, about how many businesses are connected to the Internet and their level of Internet use.

Who is conducting the study?

The study is a joint effort between academics in Botswana University of Science and Technology (Dr Galani Malatsi), Botswana University of Science and Technology (Ms Makamu Tamahala), University of the South Pacific (Professor Raghuvar Dutt Pathak), Victoria University of Wellington (Dr Sam Goundar) and University of Wollongong (William Tibben). The conduct of this research is overseen by the Human Research Ethics Committee at the University of Wollongong, NSW Australia and Human Research Ethics Committee at the Botswana International University of Science and Technology.

Why have you been selected for study?

As a business manager your experience and knowledge of running a business in Botswana will provide valuable information about your business's current use of the Internet.

What do you need to do?

To take part all you need to do is to complete the enclosed questionnaire that should take around 30 minutes. Please make sure that you sign the consent form. It is entirely your choice whether you take part in this study. If you do choose to take part, you are free to withdraw at any time up until the completion of the "active research" stage, 30 March 2020.

What sort of information is required?

You will be asked about your use of technology and the Internet to conduct business. You will also be asked about the nature of your business and your knowledge of government policy that promotes the Internet as a business medium.

Please be as accurate as you can but remember that an approximate answer is still valuable for the study. If you don't want to answer a question for any reason, you are not required to do so.

What will be done with your information?

The research findings from this study will be published in journal articles and participating University websites.

All information collected will be treated confidentially and used for this research only. Your identity and the identity of your business will not be revealed. This will be achieved through coding of survey responses, the use of pseudonyms (fictitious names) for both center names and individual names. Surveys will be stored by the University of Wollongong for five years after which they will be destroyed. Additionally, the study is accountable to the University of Wollongong Human Research Ethics Committee.

How will information from the Study be used to help business and government?

The information will give a better understanding of the way that businesses use the Internet. It will also provide information about public policy support for eCommerce. The research findings can be used by business organizations and government should they wish to address impediments to eCommerce development.

How can you find out more about this study?

If you have any questions comments or complaints about this study you can contact the following:

Chief investigator: William Tibben University of Wollongong Wollongong NSW 2522 Australia Ph: + 61 2 4221 3768. Email: wjtAuow.edu.au	For any complaints you may also contact: a) Secretary Human Research Ethics Committee Research Services Office, Research and Innovation Division University of Wollongong Wollongong NSW 2522 Ph: 02 4221 4457 Email: evesAuow.edu.au
In country investigator: Malatsi Galani Botswana International University of Science Technology Private Bag 16 Palapye, Botswana Ph: +267 493 116 Email: galanim@biust.ac.bw	 b) Chairman Human Research Ethics Committee Director of Research & Development Private Mail Bag 16 Palapye, Botswana Ph: +267 493 1222 Email: selaoloe@biust.ac.bw

APPENDIX C: CONTENT VALIDATION FORM

Validation of Small and medium enterprises in developing countries' national innovation systems: investigating the determinant factors to eCommerce adoption Inventory

Dear experts,

This inventory contains 11 subscales; knowledge flows, strategies, awareness, human resources, business resources, technological resources, commitment, governance, market forces eReadiness, government eReadiness, supporting industries eReadiness, and eCommerce adoption rate, as well as 3 demographic questions, all related to the factors affecting SMEs' readiness for eCommerce adoption. We need your expert judgement on the degree of relevance of each item to the measured domain. Your review should be based on the definition and relevant terminologies that are provided to you. Please be as objective and constructive as possible in your review and use the following rating scale:

Degree of relevance

1 = the item is not relevant to the measured domain

2 = the item is somewhat relevant to the measured domain

3 = the item is quite relevant to the measured domain

4 = the item is highly relevant to the measured domain

DEMOGRAPHIC

Definition: the characteristics of the SME

Items	Relevance			
	1	2	3	4
B1				
B2				
B3				
B4				

Comments:

--

Subscale 1: KNOWLEDGE FLOWS

Definition: the degree to which an SME has access to different sources of eCommerce information and knowledge

Items	Relevance			
	1	2	3	4
KF1				
KF2				

Comments:

Subscale 2: STRATEGIES

Definition: the extent to which SMEs collaborate with other stakeholders

Items	Relevance			
	1	2	3	4
STR1				
STR2				

Comments:

Subscale 3: AWARENESS

Definition: an organization's perception, comprehension, and projection of the benefits and risks of eCommerce

Items	Relevance			
	1	2	3	4
A1				
A2				
A3				
A4				
A5				
A6				
A7				

Comments:

Subscale 4: HUMAN RESOURCES

Definition: the availability and accessibility of employees with adequate information technology and other skills needed to staff eCommerce initiatives

Items	Relevance			
	1	2	3	4
HR1				
HR2				

Comments:

Subscale 5: BUSINESS RESOURCES

Definition: cover capabilities and assets of the SMEs

Items	Relevance			
	1	2	3	4
BR1				
BR2				
BR3				
BR4				
BR5				
BR6				

Comments:

Subscale 6: TECHNOLOGICAL RESOURCES

Definition: relate to the IT base of the organization, the extent of computerization, and experience with network-based applications

Items	Relevance			
	1	2	3	4
TR1				
TR2				
TR3				
TR4				
TR5				
TR6				

Comments:

Subscale 7: COMMITMENT

Definition: refers to support by key members of the organization, especially its CEO, to champion eCommerce

Items	Relevance			
	1	2	3	4
C1				
C2				
C3				
C4				
C5				

Comments:

Subscale 8: GOVERNANCE

Definition: refers to the strategic, tactical, and operational model that defines the way organizations structure to establish objectives, allocate resources, and make decisions

Items	Relevance			
	1	2	3	4
G1				
G2				
G3				
G4				
G5				
G6				
G7				
G8				
G9				

Comments:

Subscale 9: MARKET FORCES EREADINESS

Definition: refers to the application and use of eCommerce by a firm's competitors, customers, suppliers, and other business partners

Items	Relevance			
	1	2	3	4
MFeR1				
MFeR2				

Comments:

Subscale 10: GOVERNMENT EREADINESS

Definition: how the government affects the adoption of eCommerce

Items	Relevance			
	1	2	3	4
GVeR1				
GVeR2				
GVeR3				
GVeR4				

Comments:

Subscale 11: SUPPORTING INDUSTRIES EREADINESS

Definition: the availability and affordability of IT services, the development of the financial sector, and the penetration and reliability of transport services

Items	Relevance			
	1	2	3	4
SleR1				
SleR2				
SleR3				

Comments:

APPENDIX D: ETHICS APPROVAL

BOTSWANA INTERNATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

Private Mail Bag 16
Palapye, Botswana
Website: www.biust.ac.bw



Tel: (+267)4900117
Fax: (+267)4900102

OFFICE OF THE DIRECTOR RESEARCH, DEVELOPMENT & INNOVATION

1 December 2016

Dr. William Tibben
School of Computing and Information Technology
Faculty of Engineering and Information Sciences
University of Wollongong
Northfields Avenue
Wollongong, NSW 2522
Australia

Dear Dr. Tibben,

ETHICS APPROVAL

I am pleased to advise that the following Human Research Ethics application has been approved.

Ethics Number:	BIUST HE/2016/078
Research Project	Title: e-commerce adoption in Botswana
Researchers:	Dr. William Tibben, Dr. Malatsi Galani
Approval Date:	28 September 2016
Expiry Date:	27 September 2017

A condition of the approval by the University Ethics committee is the submission of a progress report annually and a final report on the completion of your project.

If you have any queries regarding the Ethics review process, please contact the Directorate of Research & Development on phone +267 493 1222 or email selaoloe@biust.ac.bw

Yours sincerely,


Dr. Edson Selaolo
DIRECTOR OF RESEARCH & DEVELOPMENT
HUMAN RESEARCH ETHICS COMMITTEE

APPENDIX E: RESEARCH PERMIT

18

Telephone : 3655400 / 3655483
Fax : 3914271
E-mail: botsamote@gov.bw



Block 6, Government Enclave, Headquarters
Private Bag 00517 Gaborone

MINISTRY OF TERTIARY EDUCATION, RESEARCH, SCIENCE AND TECHNOLOGY

REF: MOTE 1/18/6 VII (61)

2nd October 2019

Makamu Tamahala
P O Box 215
PALAPYE

Dear Madam,

APPLICATION FOR RESEARCH PERMIT

"The Adoption of Ecommerce in Botswana SMEs: An Analytic Framework"

Reference is made to your application on the above captioned matter. Your application for Research Permit for the proposed research titled: **"The Adoption of Ecommerce in Botswana SMEs: An Analytic Framework"** has been granted. The permit is valid for two (2) years. You are kindly advised to peruse section 4.4 to 5.0 of the 'Guidelines for Application for Research Permit' in Botswana and ensure you comply with any applicable visa and residence permit requirements.

Any changes in the proposed research should be communicated, without fail, to the Permanent Secretary, Ministry of Tertiary Education Research Science and Technology citing above reference. The Botswana Government reserves the right to request at short notice further information during the study.

By copy of this letter, the Director of Research Science and Technology is advised to take note of this development and ensure that deliverables to government are timely met.

Yours faithfully


Dr Kekgonne E. Baipoledi
For/Permanent Secretary



cc: **Director of Research Science and Technology**

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APPENDIX F: ITEM ANALYSIS: CORRECTED ITEM-TOTAL CORRELATION

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
B1	199.91	945.835	-.068	.945
B2	199.64	918.114	.450	.943
B3	199.94	927.684	.368	.944
B4	199.45	902.381	.761	.942
KNWFLO1	198.21	923.360	.326	.944
KNWFLO2	198.39	911.184	.495	.943
K3WFLO3	198.27	919.642	.361	.944
KNWFLO4	198.12	918.735	.390	.943
KNWFLO5	198.52	921.195	.342	.944
KNWFLO6	198.39	914.184	.448	.943
KNWFLO7	198.64	904.676	.627	.942
KNWFLO8	198.52	913.820	.460	.943
KNWFLO9	198.76	909.252	.578	.943
KNWFLO10	198.82	914.153	.509	.943
KNWFLO11	198.70	909.968	.550	.943
NET1	199.52	938.508	.222	.944
NET2	197.73	944.017	-.010	.945
NET3	198.42	936.689	.110	.945
NET4	198.00	948.000	-.084	.946
NET5	197.79	947.297	-.087	.945
NET6	197.91	937.335	.142	.944

NET7	198.18	939.591	.072	.945
A1	198.00	911.812	.475	.943
A2	198.09	905.835	.616	.942
A3	197.73	938.705	.070	.945
A4	197.97	907.780	.508	.943
A5	197.30	930.718	.205	.944
A6	197.97	917.405	.440	.943
A7	197.91	912.648	.502	.943
HR1	197.82	921.966	.297	.944
HR2	198.09	904.273	.604	.942
BR1	197.76	945.752	-.046	.945
BR2	197.39	935.496	.146	.944
BR3	197.79	929.360	.250	.944
BR4	198.73	924.330	.345	.944
BR5	198.85	963.195	-.316	.947
BR6	197.70	922.280	.384	.943
TR1	198.52	896.133	.688	.942
TR2	198.27	910.830	.517	.943
TR3	198.12	903.047	.539	.943
TR4	198.27	907.142	.560	.943
TR5	198.30	902.155	.555	.943
TR6	198.12	912.860	.520	.943
C1	198.00	902.562	.680	.942
C2	198.45	923.506	.363	.944
C3	198.52	918.195	.449	.943

C4	198.52	914.695	.476	.943
C5	198.42	909.752	.583	.943
G1	198.30	898.030	.659	.942
G2	198.27	901.580	.715	.942
G3	198.18	897.903	.726	.942
G4	198.18	891.778	.724	.942
G5	198.42	891.564	.723	.942
G6	198.18	899.841	.741	.942
G7	198.27	906.767	.602	.942
G8	198.15	911.258	.535	.943
G9	198.21	896.110	.622	.942
MFeR1	197.94	899.434	.664	.942
MFeR2	197.97	901.468	.587	.942
GVeR1	198.06	905.996	.471	.943
GVeR2	197.82	909.716	.475	.943
GVeR3	197.88	914.297	.444	.943
GVeR4	197.79	902.047	.589	.942
SlEr1	197.88	924.797	.298	.944
SlEr2	198.27	905.267	.628	.942
SlEr3	198.45	905.131	.534	.943

APPENDIX H: PLAGIARISM

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