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Influence of business environmental factors on the rate of cloud computing adoption by commercial banks in Kenya.

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Influence of Business Environmental Factors on the Rate of Cloud Computing Adoption by Commercial Banks in Kenya

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the dissertation contains no material previously published or written by another person except where due reference is made in the dissertation itself.

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ABSTRACT

Cloud computing as a technology has received considerable attention in research and is making a significant impact on organizations globally. This is all attributed to the agility it provides in the provisioning of technology services for business operations and adapting to industry changes thus offering avenues for boosting profitability. However, in spite the benefits, the rate of adoption of the technology varies across regions and industries, with some such as the financial services sector though an early adopter has been reported to have low adoption rates, for example, approximately 20 - 40 percent in Kenya. The financial services sector which includes the banking sub-sector, significantly contributes to the global and local economy (approximately 5.5% of the nominal Gross Domestic Product in Kenya in 2022), and views cloud computing as a technology that can unlock capabilities that lead to business transformation thus essential to adaptability. Therefore, this study aimed at assessing how the business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya. It specifically examined how vendor support, competitive and trading partners' pressure influence adoption rates. The study was based on a descriptive design anchored on two theories, that is, Diffusion of Innovations and the Technology, Organizational and Environmental framework. Structured questionnaires were distributed to respondents with different roles in all 39 licensed commercial banks to collect the primary data while secondary data was collected from reports of previously concluded studies from the Central Bank of Kenya. Quantitative methods of data analysis, that is, both descriptive and inferential statistics were utilized. The response rate obtained was 62%. Factor analysis and subsequently, ordinal logistic regression found that competitive and trading partners' pressure negatively influence the rate of cloud computing adoption. More specifically, price competition in the industry and competitive products offered by trading partners only on cloud platforms respectively were the factors that had a significant influence. While two factors associated with vendor support were found to positively influence the adoption rate, that is, the provision for architectural support and the requirement for cloud vendors to provide access to 24/7 cloud support irrespective of severity of the cases. In the last period of one year, the adoption rate was reported as 33% and 40% for general use cloud computing services and business-critical services respectively by the commercial banks in Kenya. There were limitations in the study related to the unavailability of the respondents and the political unrest experienced during the period of data collection, however mitigations such as electronic data collection were implemented. The study recommended that cloud vendors should consider building awareness about their support offerings and tailoring solutions for the banks. Trading partners should consider other incentives or approaches, for example, where there is mutual benefit to be realized, for purposes of adoption of the technology. The findings from this study provide additional insight into what specific aspects of vendor support, competitive and trading partners' pressure influence the rate of cloud computing adoption, for example, competition on price was found to have a significant negative influence on the adoption rate. It also could provide insights to assist the banks to improve their agility in industrial and customer changes and become more operationally efficient.

Keywords: cloud computing, rate of technology adoption, cloud in commercial banks, cloud in Kenya, business environment, DOI, TOE

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ABBREVIATIONS AND ACRONYMS

CAGR	Compound Annual Growth Rate
CBK	Central Bank of Kenya
CMA	Capital Markets Authority
CRB	Credit Reference Bureaus
DOI	Diffusion of Innovations Theory
EAC	East African Community
IaaS	Infrastructure as a Service
IRA	Insurance Regulatory Authority
IT	Information Technology
MFB	Microfinance Banks
MRP	Money Remittance Providers
NACOSTI	National Commission for Science, Technology and Innovation
NIST	National Institute of Standards and Technology
PaaS	Platform as a Service
RBA	Retirement Benefits Authority
SaaS	Software as a Service
SASRA	Sacco Societies Regulatory Authority
TOE	Technology, Organization, Environment Framework

DEFINITION OF TERMS

DOI attributes	These attributes are the innovation's characteristics which determine its adoption rate and include relative advantage, complexity, compatibility, observability and trialability (Rogers, 1983).
Environmental Factors (TOE factor)	These consider the external domain in which the organization operates .i.e., the macro environment, for example, competitors, trading partners, vendors, government or other regulatory bodies among others (Eze et al., 2019; Oliveira & Martins, 2011).
Organizational Factors (TOE factor)	These consider the scope, firm size, managerial structure, and associated complexities (Gangwar et al., 2015).
Rate of adoption	It is "the relative speed with which an innovation is adopted by the members of a social system" (Rogers, 1983).
TOE factors	The TOE framework identifies three core aspects or factors that may influence technology adoption by an organization, that is, technological, organizational, and environmental factors. These are further associated with subfactors such as firm size within the organizational factors (Alkhater et al., 2014; Oliveira & Martins, 2011)
Technological Factors (TOE factor)	These consider technology that is internal and external to the organization and also includes past and future technologies in the market that the organization operates which are considered useful for the organization (Eze et al., 2019; Oliveira & Martins, 2011).

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CHAPTER 1 : INTRODUCTION

1.1 Background of the Study

Cloud computing has been defined by the United States' National Institute of Standards and Technology (NIST) as a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction (Mell & Grance, 2011). It is making a significant impact on Information Technology (IT) (Oke et al., 2021; Serena et al., 2021; Srivastava et al., 2021) with global revenue projections of $640 Billion within the next five years (Deloitte, 2022) and receiving extensive attention in research (Sharma et al., 2021; Vahdat, 2021; World Bank Group, 2021) as it has revolutionized the development and delivery of IT and business services (Cirera et al., 2021; Dener, 2021).

Specifically with regard to agility in service provisioning and delivery, the ease of elasticity with which organizations can scale and or shrink their compute requirements on-demand (Kushagra & Dhingra, 2021; Oke et al., 2021) while providing services to customers, was once a long dreamed vision, but is now a reality. This flexibility offers organizations the ability to test and provision new solutions without the lengthy procurement processes previously experienced (Jianwen & Wakil, 2019; Scott et al., 2019). Other benefits attributed to the adoption of cloud computing can be classified under categories such as economic, scalability, ubiquity, and innovation (Eldalabeeh et al., 2021; Khalil, 2019; Oke et al., 2021). These benefits have accelerated the popularity of cloud computing (Jianwen & Wakil, 2019; Khalil, 2019; Oke et al., 2021) as organizations seek to exploit the potential returns from investments in this technology.

Notwitstanding the promise of the potential returns to organizations, the rate of adoption of the technology contrasts across geographies (Senyo et al., 2016; Sharma et al., 2021), enterprises (Tiren, 2017), .i.e. small and medium, large enterprises, industries (Makori, 2016; Misra & Doneria, 2018) and the individual or personal characteristics of IT professionals in their respective workplaces (Aharony, 2015; Jianwen & Wakil, 2019). With an aim to understand the factors influencing the variations, a study conducted in Saudi Arabia in the manufacturing, energy and engineering sectors concluded that those respondents who believed that cloud computing was adopted by their competitors thus offering them an advantage over others in the market, had more readily adopted the technology (Alkhater et al., 2014). Other studies conducted in the sectors of

technology and financial services in India and United Kingdom (Gangwar et al., 2015; Gutierrez et al., 2015; Sharma et al., 2021) corroborate these results. However, contradictory findings were obtained in studies conducted in Turkey, Saudi Arabia and Bangladesh where this pressure from competitors was found to have no significant impact on the rate of adoption across similar sectors (Almubarak, 2017; Khayer et al., 2020; Sayginer & Ercan, 2020). It was explained, for example, in Bangladesh, that competitive pressure was an insignificant business environmental influencer because the organizations were yet to adopt the ability to relate the associated benefits of adoption with competitive advantage. Along with this, other differing findings have also been obtained about the significance of other business environmental factors such as pressure from trading partners (Alkhater et al., 2014; Gutierrez et al., 2015; Sharma et al., 2021) and support from vendors (Tiren, 2017; Wambugu, 2018) among others. As such, due to these contradictory findings and inconsistencies, this study sought to further assess how the abovementioned business environmental factors, that is, vendor support, competitive and trading partners' pressure, influence the rate of cloud computing adoption by commercial banks in Kenya.

Lastly, among the various sectors, the financial services sector which contributes approximately 20 percent to the global Gross Domestic Profit (GDP) (Economist Intelligence Unit, 2021), and more specifically the banking sub-sector have been identified as one of the early adopters of the technology though the adoption rate is observed to be low (about 20 percent) (Mckinsey, 2018; Temenos & Amazon Web Services, 2020). Additionally, although previously, regulatory and organizational challenges were considered as key adoption inhibitors, a recent survey conducted in the UK and other European countries observed that financial institutions now consider cloud computing to be essential to their business strategy as it unlocks capabilities that lead to business transformation (Reply, 2021). The survey further noted that regulators such as the Bank of England also recognize that competitive advantage in today's market relies on the transformation of services through the use of technologies such as cloud computing. As such, these regulators were noted to be working alongside Cloud Service Providers (CSPs) and other stakeholders to adapt their policies so as to ease the adoption of cloud computing (Reply, 2021).

Similarly in Kenya, the adoption rate is for example, approximately 20 – 40 percent in the financial as well as other sectors (Omwansa et al., 2014) and more specifically, 27 percent and 60.8 percent in the insurance and microfinance institutions subsectors (Meshack, 2015; Munya, 2017). Due to similarly changing market needs, a recently concluded banking sub-sector survey stated that not only do banks consider cloud computing a major area of focus for innovation in the next four years, but that the Central Bank of Kenya (CBK) has taken the lead in the development of a minimum

standards document for review and use by banking institutions in the East African region (Central Bank of Kenya, 2021a, 2021b; Meshack, 2015; Tiren, 2017; Wambugu, 2018). The financial services sector which includes the banking sub-sector in Kenya plays a key role in the country's economic development which is evidenced by it's significant contribution to the country's nominal GDP of approximately 5.5 percent in 2022 (Kenya National Bureau of Statistics, 2023). Thus, making it one of the top contributors to the cumulative national nominal GDP. Therefore, this study was conducted with the aim of assessing how business environmental factors influence the rate of cloud computing adoption in commercial banks in Kenya.

1.1.1 The Business Environment

The business environment of an organization consists of internal and external factors which affect its response to challenges and opportunities. Based on the analysis of external environmental factors, organizations typically review their internal environment with the intent of identifying and pursuing potential strategies. These external factors can be classified either by source, that is, economic, social, technological, competitive, political and legal; or proximity, that is, the micro- and macro-environment (Afuah, 2009; Dess et al., 2016; Grant, 2010). Among those classified by source, the competitive influencers, specifically within commercial banks in the Kenyan financial services sector, have been noted to have a more direct significant effect on strategy, survival, market positioning and profitability (Grant, 2010; Njiffia, 2009).

Among the competitive influencers, an understanding of certain fundamental concepts is crucial in order to differentiate the essential from those which are important. Firstly, for a commercial bank or any organization to generate profits, value must be created for customers. As such, an understanding of it's customers is essential. Secondly, in the creation of value, the commercial banks or organizations will typically secure services and or goods from suppliers, thus, it is crucial to get to know and manage relationships with them. Thirdly, a key influencer of profitability is the intensity of the competition that exists between the organizations vying for the same business opportunities. If the intensity of competition is low, good profits are typically expected while high intensity is associated with low profits. Thus, organizations must understand their competitors. Therefore, the nucleus of an organizations business environment is constituted of the sets of relationships it has with the three primary categories of players mentioned above, that is, customers, suppliers and competitors (Grant, 2010; Whittington et al., 2020).

As such, for a commercial bank to adequately compete in the market, it would need to critically understand and consistently monitor it's relationships with the above-mentioned players. On this

basis along with the findings and gaps identified from previously conducted research which this study sought to bridge (Alkhater et al., 2014; Khayer et al., 2020; Sayginer & Ercan, 2020; Sharma et al., 2021; Tiren, 2017; Wambugu, 2018), competitive pressure from other commercial banks in the market, trading partners' pressure from customers (etc.) and vendor support from suppliers such as cloud service providers, were the influencing factors assessed within this study with regard to the rate of cloud computing adoption.

Aside from the potential benefits associated with boosting profitability and business agility, growth in the adoption rates of cloud computing as a technology could have a far-reaching impact as the adoption and integration of IT within the financial services sector is classified as one of the key growth drivers in Kenya's development blueprint, Vision 2030 (Government of Kenya, 2007). Furthermore, one of the key regulators in the sector, Central Bank of Kenya, not only recognizes the benefits associated with cloud computing, but has identified it as a key development area in a recently concluded Banking Sector Survey in 2021 (Central Bank of Kenya, 2021b, 2021a). Subsequently, the regulator took the lead in the development of Minimum Standards for Guidance on Cloud Computing to licensed institutions by the East African Community (EAC) central banks (Central Bank of Kenya, 2021a). This implies that an examination of the business environment factors influencing the adoption rates would be of benefit to the industry.

Therefore, this study sought to examine how the three above-mentioned business environmental influencers associated with competition, that is, competitive pressure, trading partners' pressure and vendor support influence the rate of cloud computing adoption by commercial banks in Kenya. This examination provided an understanding and basis for recommendations offered so as to improve the cloud adoption rates with the expectation that other benefits such as higher profitability from increased operational efficiencies will be realized.

1.1.2 The Financial Services Sector in Kenya

The financial services sector in Kenya comprises deposit taking institutions (commercial banks and mortgage finance companies, microfinance banks and deposit-taking Savings and Credit Co-operatives (Saccos)), non-deposit taking institutions (insurance industry, pensions industry, capital markets industry, and Development Finance Institutions) and financial markets infrastructure providers. The sector is regulated and supervised by; Capital Markets Authority (CMA); Central Bank of Kenya (CBK); Insurance Regulatory Authority (IRA); and the Sacco Societies Regulatory Authority (SASRA) (Central Bank of Kenya, 2022a).

As of 31 December 2022, the banking sector in Kenya comprised of CBK as the regulator, 39 banks, 10 foreign bank representative offices, 14 Microfinance Banks (MFBs), 3 Credit Reference Bureaus (CRBs), 19 Money Remittance Providers (MRPs), 8 non-operating bank holding companies, 10 Digital Credit Providers (DCPs), and 72 foreign exchange (forex) bureaus (Central Bank of Kenya, 2022a). The banking sub-sector accounted for a greater percentage of the total assets in the sector as of December 2021 (Central Bank of Kenya, 2021a; Insurance Regulatory Authority, 2022).

1.2 Statement of the Problem

This study sought to assess how the business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya. This is due to the fact that in spite all the known benefits resulting from the adoption of the technology, it has not been widely adopted which accentuates the missed opportunities. For example, in developing countries, that is, specifically in Kenya, the rate of cloud computing has for example been noted to be approximately 20 – 40 percent in the financial as well as other sectors and more specifically, 27 percent and 60.8 percent in the insurance and MFIs subsectors (Khalil, 2019; Meshack, 2015; Munya, 2017; Omwansa et al., 2014). Research (Meshack, 2015; Wambugu, 2018) indicates that within the few financial services sector organizations outside the MFIs that have adopted the technology, it is predominantly being used or intended for use cases related to communication such as email and websites, that is, approximately 85%, instead of the fulfilment of other core business service requirements (approximately 15%), where more significant benefits are typically expected. For instance, the Bank of America made a $2 billion annual saving upon investing in cloud computing while another global bank reduced it's finance departments' cost by 30 percent after adoption (Ernest&Young, 2019; Morell & DeFrancesco, 2019). Cummulatively, this highlights missed opportunities for potentially increasing operational efficiency and market share through cost reduction and innovation respectively.

Also, while financial institutions may be one of several other players in the cloud adoption ecosystem in this regard, that is, regulators, cloud service providers, suppliers or partners, they are the final consumer of the technology. It is only upon their adoption that the benefits of the technology are realized by themselves and the industry in general. Furthermore, for two subsequent years, that is, 2020 and 2021, the Banking Sector Innovation Survey conducted by CBK found that cloud computing is recognized by the financial institutions as a key innovation area (Central Bank of Kenya, 2020b, 2021b). This implied that there was a need to improve adoption rates within the banking sub-sector, which offered additional motivation for this study that sought to assess how

business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya.

Additionally, in order to determine the influencers of adoption rates, other studies (Ajowi & Reuben, 2019; Meshack, 2015; Tiren, 2017; Wambugu, 2018) conducted within the financial services sector have found that business environmental factors associated with competitor or trading partner pressures, are common influencers for the rate of cloud computing adoption. They stated that an organization facing increasing external pressure from competitors, trading partners or suppliers, was more likely to adopt cloud computing than another without the same pressure. However, contradictory findings were also noted about the significance of these factors to the adoption rate. For example, in Egypt research administered across 550 employees in different organizations to understand the factors influencing cloud adoption rates found that competitive pressure had an insignificant effect (Almubarak, 2017; Ayman et al., 2018; Gangwar et al., 2015; Khayer et al., 2020; Senyo et al., 2016; Shetty & Panda, 2022; Skafi et al., 2020). These contradictory findings, coupled with methological and contextual gaps found in existing studies (Alkhater et al., 2014; Almubarak, 2017; Sayginer & Ercan, 2020; Tiren, 2017) highlight inconsistencies and gaps which this study sought to bridge by further assessing how business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya.

1.3 Research Objectives

1.3.1 General Objective

The study was aimed at assessing how the business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya.

1.3.2 Specific Objectives

The specific objectives of this research were:

i. To examine how competitive pressure influences the rate of cloud computing adoption by commercial banks in Kenya.
ii. To examine how trading partners' pressure influences the rate of cloud computing adoption by commercial banks in Kenya.
iii. To examine how vendor support influences the rate of cloud computing adoption by commercial banks in Kenya.

1.4 Research Questions

The research questions of this research were:

i. How does competitive pressure influence the rate of cloud computing adoption by commercial banks in Kenya?
ii. How does trading partners' pressure influence the rate of cloud computing adoption by commercial banks in Kenya?
iii. How does vendor support influence the rate of cloud computing adoption by commercial banks in Kenya?

1.5 Scope of the Study

This research was focused on assessing how business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya. These business environmental factors which are external to the banks but affect their performance and decisions, were considered under three core categories, that is, customers for whom value is created, suppliers who provide the goods and services for value creation, and the competition who are vying for the same business opportunities. These core categories were evaluated in this study as trading partners' pressure from customers (etc.), vendor support from suppliers and competitive pressure from other commercial banks in the market.

The study integrated two theoretical models i.e., the Diffusion Of Innovations (DOI) theory and the Technology, Organization and Environment Framework (TOE). DOI was used to assess the rate of cloud computing adoption while TOE offered the business environmental factors for consideration in the adoption.

The study period was from 2017 to 2023, thus considering commercial banks that have been in operation during that time. This allowed for the capturing of more up-to-date information given the dynamic nature of the banking sub-sector and thereafter, offer more relevant recommendations.

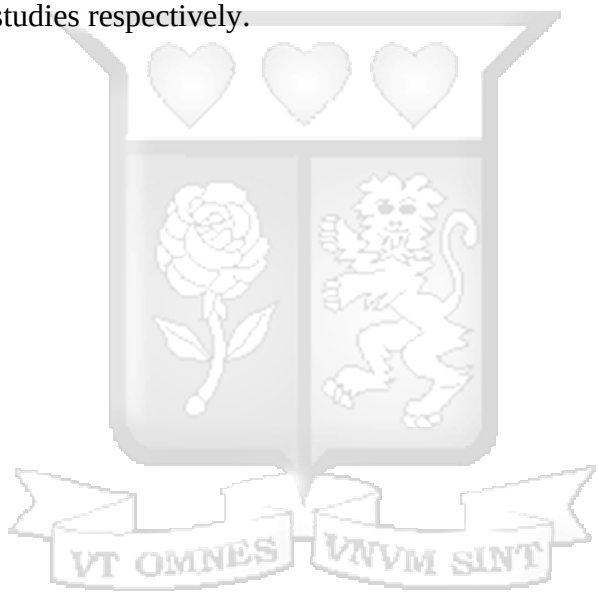
1.6 Significance of the Study

This research is expected to be beneficial to the commercial banks in Kenya and the broader banking sub-sector, specifically key decision-makers or practitioners such as Chief Operations Officers, Chief Information Officers, Strategy Officers among others, by providing insights on the business environmental factors influencing the rate of cloud computing adoption. These insights

could assist the banks to improve their agility to market and customer changes, become more operationally efficient, and provide areas of improvement among others.

The findings would also be beneficial to the regulator in the banking services sub-sector, that is, CBK, in understanding the perspective of those in the sub-sector, that is, commercial banks, who may or may not have adopted cloud services. Thus, offering channels for collaboration to support the growth in the rate of adoption of cloud computing where applicable.

Lastly, the Kenyan government and scholars or researchers would also use the findings of this research. The information provided could offer insights on how the government could additionally facilitate the growth in the rate of adoption since the benefits could be far-reaching as well as offer a basis for future related studies respectively.



CHAPTER 2 : LITERATURE REVIEW

2.1 Introduction

The adoption of cloud computing like other technologies has been studied extensively with various technology adoption theories broadly categorized at individual and organizational levels. At the organizational level, different factors associated with the theories have been noted in literature to influence adoption rates. As such, this study primarily focused on assessing the business environment factors influencing the rate of cloud computing adoption by commercial banks in Kenya.

This section reviews the key concepts used in this research and identifies some of the theoretical contributions from previous literature. It also includes literature and empirical reviews and a conceptual framework showing the graphic relationship of the study variables.

2.2 Theoretical Review of Literature

This section provides foundational information on cloud computing concepts as well as a review of the relevant theories which explain the affiliations between the business environmental factors and the rate of cloud computing. Two theories were considered for this study, that is, Diffusion of Innovations Theory and the Technology, Organization and Environment framework.

2.2.1 Cloud Computing Concepts

This subsection covers the foundational concepts of cloud computing for ease of understanding. It includes, the characteristics of cloud computing, service and deployment models.

Characteristics of Cloud Computing

The essential characteristics that a cloud computing service should have are the ability to offer on-demand self-service allowing automatic service provisioning without human intervention; broad network access across a variety of client platforms such as mobile phones and laptops; rapid elasticity of resources allowing the ability to scale vertically or horizontally with demand; resource pooling using a multi-tenant model to serve several customers who have no control or knowledge over the exact location of the provided resources, and lastly, a measured service by leveraging metering capabilities suitable for the type of service with resource utilization transparency to both customer and the provider. Examples of resources include memory, processing or computing, and storage among others (Mell & Grance, 2011).

Service Models

According to NIST, cloud computing is offered through three major service offerings typically called models. These are Infrastructure as a Service (IaaS), Software as a Service (SaaS) and Platform as a Service (PaaS) (Mell & Grance, 2011).

Infrastructure as a Service (IaaS) offers the ability for customers to provision computing, storage, and networking resources among others, to run their operating systems and applications but with no control of the underlying infrastructure (Mell & Grance, 2011). The cloud service provider controls the infrastructure components (Scott et al., 2019).

Secondly, Software as a Service (SaaS) allows customers to make use of the cloud provider's applications already running on the infrastructure. In this service model, the cloud provider controls the underlying infrastructure, operating systems, and applications. Customers can access the application over different client platforms such as a web browser, and program interface (Mell & Grance, 2011).

Lastly, Platform as a Service (PaaS) which offers more flexibility than the SaaS service model, allows the customer to develop and use the software on the application and development infrastructure offered by the cloud service provider (Scott et al., 2019). They have no control of the underlying infrastructure but can control the deployed applications and the associated configuration settings for the application-hosting environment (Mell & Grance, 2011).

Deployment Models

A cloud deployment model is a representation of a specific cloud environment, which is distinguished by characteristics such as size, access and ownership. Notably, there are four deployment models as defined by the NIST, that is, private, public, community and hybrid cloud (Mell & Grance, 2011).

The infrastructure provisioned for the private cloud deployment model is for exclusive use by a single organization and is managed by the same organization, a third party or a combination of both. It may exist on or off the affected organization's premises (Mell & Grance, 2011).

With the public cloud, standardized and commoditized infrastructure is provisioned for open use by the public (Scott et al., 2019). It may be owned, operated, and managed by a business, government, academic organization, or a combination of them but the infrastructure resides on the premises of the cloud provider (Mell & Grance, 2011).

Community cloud infrastructure is provided for the single-use by a community of users from organizations with shared concerns such as policy and compliance considerations. The infrastructure may be owned, operated and managed by one or more of the community organizations, a third party or a combination of them (Mell & Grance, 2011).

Finally, a hybrid cloud is a combination of two or more deployment models that remain distinct, but are united by technology. This is meant to enable data and application portability (Mell & Grance, 2011).

2.2.2 Supporting Theories

Cloud computing adoption could be considered a subset of IT adoption (Ali et al., 2020) for which various adoption theories exist (Oliveira & Martins, 2011) such as the Technology Adoption Model (TAM), Technology Acceptance Model, Innovation Diffusion Theory (IDT/DOI), Theory of Reasoned Action (TRA), Technology-Organization-Environment (TOE), Theory of Planned Behaviour (TPB), Unified Theory of Acceptance and Use of Technology (UTAUT) among others. These have been broadly categorized at the individual and organizational levels. At the individual level, previous studies show that the TAM, TPB, UTAUT and TRA models are applicable while TOE and DOI are affiliated at the organizational level (Gangwar et al., 2014; Oliveira & Martins, 2011). Additionally, TAM and UTAUT primarily consider the technology capabilities while TRA and TPB measure the "cognitive and psychological aspects of the technology" which were all not of relevance to this study (Krithika & Dr. Rajini, 2016; Rejali et al., 2022; Samaradiwakara & Gunawardena, 2014; Y Yousafzai et al., 2010). This study required a supporting theory or theories at the organizational level that provided a basis of measuring the rate of technology adoption as well as business environmental factors that influence adoption.

As such, for this research, integration of the TOE and DOI theories was utilized based on their significance in studies conducted on cloud computing adoption at the organizational level as well as their provision of the other requirements for this study . The following sections describe each of the models with the applicable constructs to be used and an analysis of the integrated approach.

2.2.2.1 Diffusion Of Innovations Theory (DOI)

The DOI theory shows how, why and at what rate innovations are widespread among societies and is applicable at both the individual and organizational level. An innovation, according to this theory, "is an idea, practice, or project that is perceived as new by an individual or other unit of adoption". As such, an innovation could have been developed awhile back but perceived as new by the unit of adoption. Furthermore, due to the considerable amount of diffusion research done

concerning technological research, the words “technology” and “innovation” are used interchangeably by Everett Rogers who developed the theory in 1960s (Lai, 2017; Rogers, 1983, 2003). It was therefore appropriate for determining the rate of technology adoption as is required by this research.

This theory explains that diffusion of a technology is spread through certain communication channels overtime among particular groups of individuals. It highlights that even though a technology may have apparent benefits, its adoption may be difficult and occur over an extended period of time which then brings to the foreground the importance of determining and where necessary, accelerating the rate of adoption. Hence, it introduces a time dimension, referring to it as the rate of adoption, for purposes of measuring the relative speed with which a technology is adopted among particular groups. This rate of technology adoption is typically measured by the number of adopters of the technology in a specific period of time (Oliveira & Martins, 2011; Rogers, 1983, 2003).

Additionally, the theory further provides five adopter categories, that is, innovators, early adopters, early majority, late majority and lastly, laggards. The innovators have been described as those willing to take risks and leading in terms of testing new technologies. Therefore, they play “a gatekeeping role in the flow of new ideas into a social system”, which in this case is the banking sub-sector. They also account for 2.5 percent of the group considered for the technology adoption (Rogers, 1983, 2003).

The early adopters consist of the largest number of opinion leaders who are sought after for their views and analysis of the technology of interest. The early majority usually adopt for a technology or new idea before the average person or organization, and are rarely in leadership positions. The late majority typically adopt a technology or new idea due to different pressures such as economic or network related pressures, thus, only adopting after the majority. Lastly, the laggards are described as those who are traditional, tend to only adopt technology when they’re certain it will not fail and may adopt even when the technology has been superseded by newer technologies. These categories respectively account for 13.5 percent, 34 percent, 34 percent and 16 percent of the group considered for the technology adoption (Rogers, 1983, 2003).

Therefore, this study utilized this theory, DOI, to determine the rate of cloud computing adoption by commercial banks in Kenya. It provided an accurate measure of the dependent variable including the categorization of the adopters.

2.2.2.2 Technology, Organization and Environment (TOE) framework

The TOE framework was developed by Tornatzky and Fleischer in 1990 to examine the organizational-level adoption of technology. It identifies three contexts that may influence technology innovation and process implementation: technological, organizational, and environmental contexts (Oliveira & Martins, 2011) of which only the environmental context will be considered as part of this study.

The technological context considers technology that is internal and external to the organization (Oliveira & Martins, 2011). It also includes past and future technologies in the market that the organization operates which are considered useful for the organization (Eze et al., 2019). The organizational context considers the scope, firm size, managerial structure, and associated complexities (Gangwar et al., 2015).

The environmental context considers the external domain in which the organization operates .i.e., the macro environment, for example, competitors, trading partners, vendors, government or other regulatory bodies among others. Based on previous research that adopted this model, three constructs were seen to have a more significant impact on the rate of cloud adoption, that is, competitive pressure, trading partners' pressure and vendor support. These constructs were seen to either accelerate or inhibit the rate of adoption of cloud computing (Eze et al., 2019; Oliveira & Martins, 2011; Wambugu, 2018).

Competitive pressure or pressure from competitors is associated with the potency of the pressure experienced by other organizations in the same market and industry. It has been noted to drive technology adoption especially when there is a strategic need for it to compete in the market. Additionally, since the advantages associated with cloud adoption include operational efficiencies and reduction of costs, among others which could result in higher profits and an organization could outperform it's competitors thus altering the industry structure (Gangwar et al., 2015; Gutierrez et al., 2015).

Additionally, organizations rely on trading or business partners for the sustenance of their businesses, that is, through the provision of services. Trading partners' pressure through customers has been noted as a key predictor of the rate of cloud adoption (Gutierrez et al., 2015; Jianwen & Wakil, 2019; Wambugu, 2018).

Vendor support is associated with external partners or suppliers who offer assistance through all phases of the technology adoption process (Stamenkov & Zhaku-Hani, 2021). A lack of expertise

and infrastructure among other requirements, in cloud computing from relevant partners has been seen to create a technology gap which negatively affects the rate of adoption since it is seen to potentially influence services uptime (Ahmed, 2020; Li et al., 2015; Sharma & Sehrawat, 2020).

Based on the above and aligned with the aim of this study, the business environmental factors of the TOE framework were utilized. The three constructs associated with the context, that is, competitive pressure, trading partners' pressure and vendor support, provided insights into how they each influence the rate of cloud computing adoption by commercial banks in Kenya.

2.2.2.3 *Analysis of the multi-theoretical model approach's suitability for this study*

The aim of this study was to assess how the business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya. In order to achieve this, the consideration of theoretical model(s) that determine the rate of adoption of technology at an organizational level while taking account of business environmental factors was required. The theoretical model, DOI, is noted to have been utilized extensively over many years to show how, why and at what rate various technologies including cloud computing are adopted at the organizational level by different studies (Mitra et al., 2022; Nath et al., 2022; Oliveira et al., 2014; Oliveira & Martins, 2011; Shant et al., 2022; Zamani, 2022). However, this focus on the technological perspective with no consideration of other key variables (Basloom et al., 2022; Oliveira & Martins, 2011) such as the environmental context of an organization among others is a limitation which was overcome with the integration of another model, the TOE framework.

The TOE framework addresses the fundamental elements of technology adoption for any organization, that is, technological, organizational, and environmental factors. It also has strong consistent empirical support and has been classified as one of the most widely used theoretical models for explaining the adoption of a wide variety of technologies including cloud computing within the financial services sector (Chang et al., 2019; Fonseka et al., 2020; Ganguly, 2022; Ghobakhloo et al., 2022; Mujahed et al., 2021; Senyo et al., 2016; Wambugu, 2018; Wang et al., 2017). As such, within the context of this study, the framework was adopted for consideration of the business environmental factors.

However, from previous studies (Gangwar et al., 2015; Stamenkov & Zhaku-Hani, 2021), it was advised that the framework should be strengthened by other models with clearer constructs as it was noted to be generic. Therefore, an integrated approach of the two theoretical models, TOE and DOI, was proposed for this study to strengthen the anticipated findings by overcoming any

limitations associated with the use of the individual models. It has also been recommended that the two theoretical models be combined especially when decision makers are the target respondents and to have an improved grasp of adoption rates (Basloom et al., 2022; Chiu et al., 2017; Mousa, 2020; Oliveira & Martins, 2011). To this end, different constructs from the two theories were considered, that is, the vendors support, competitive and trading partner pressure as independent variables from the business environmental factors of TOE; and the dependent variable, rate of cloud computing adoption from DOI.

2.3 Empirical Review of Literature

2.3.1 Competitive Pressure as an influencer of the rate of cloud computing adoption

With an aim to gain competitive advantage as potential first movers in a market, organizations have been noted to leverage the use of technology, and more specifically, cloud computing. This is typically referenced as competitive pressure which has been described as the "degree of pressure resulting from a threat of losing a competitive advantage" (Akbar et al., 2022; Gui et al., 2020; Shetty & Panda, 2022). It compels those in the respective market to consider improvements to their existing offerings or products and search for possible alternatives that would provide better outcomes for their customers (Alshamaila et al., 2013; Misra et al., 2019). Thus, pressure from competitors can positively influence the rate of adoption of a given technology.

With regard to the rate of cloud computing adoption, it has been noted to positively affect the rate of adoption due to the increasingly competitive markets, organizations then are driven to follow industry leaders or other players who may have adopted the technology for example, to drive innovation as an advantage (Gangwar et al., 2015; Gutierrez et al., 2015; Jianwen & Wakil, 2020; Salimon et al., 2021; Scott et al., 2019). In a study conducted in China on the determinants of switching intention to cloud computing in large enterprises with top decision-makers, it was concluded that pressure from the industry considerably influences switching benefits which positively affect the intention to switch to cloud computing, specifically private clouds (Chang et al., 2019). This same finding was identified in India in a study with data from 280 companies within the finance, IT and manufacturing sectors (Gangwar et al., 2015).

Within Africa, research administered in Egypt across 550 employees in different organizations to understand the factors influencing cloud adoption found a contradictory result, that is, competitive pressure had an insignificant effect. Other environmental factors such as trading partners' pressure among others were found to have more significance (Ayman et al., 2018). However, this seems to vary from studies conducted in Kenya on over 300 SMEs and another on insurance companies

that found that adoption is essential for business survival in a highly competitive environment (Meshack, 2015; Tiren, 2017). These contradictory findings highlight a gap in the literature which this study sought to address by further examining how competitive pressure influences the rate of adoption of cloud computing by commercial banks in Kenya.

With reference to the above-mentioned studies and in the context of this study, competitive pressure was referred to as the intensity of pressure sensed from other industry competitors as a result of the adoption of the respective technology. It was respectively measured based on product substitutability, price competition and market share competition (Ayman et al., 2018; Gangwar et al., 2015; Gutierrez et al., 2015; Soewarno et al., 2020; Stucki & Woerter, 2019; Wambugu, 2018).

2.3.2 Trading Partners' Pressure as an influencer of the rate of cloud computing adoption

Trading partners have been defined as any individuals and or organisations with whom an organisation conducts business either downstream or upstream. As majority of the organizations rely on certain inputs from or collaboration with others to deliver their own services and achieve their objectives, they may be pushed to adopt a technology in order to maintain these collaborations (Senyo et al., 2016). This pressure can have a positive effect as it influences organizations to consider not only new ways of delivery, but also the trading partners' needs (Zamani, 2022). Thus, pressure from trading partners can positively influence the rate of adoption of a given technology.

With respect to it's influence on the rate of adoption of cloud computing, it has a positive effect since cooperating with partners would be essential to leveraging network effects to fulfil ever-changing customer requirements (Chang et al., 2019; Gutierrez et al., 2015; Ogunlolu & Rajanen, n.d.; Senyo et al., 2016). For example, within large enterprises in China, the key to influencing a switch to cloud computing was the need for an increase in awareness of the business-related benefits of the technology such as improved product or service quality, and improvement in the competitive advantage to business owners as it related to their customer needs. This along with the consistent pressure to consider new approaches to fulfil new requirements highlights the key role that trading partners such as customers and inter-organizational channels play in influencing the rate of cloud computing adoption (Chang et al., 2019; Zamani, 2022).

Aligned with the above, studies conducted in Ghana and Kenya found that trading partners' pressure was found to be a significant determinant of the rate of cloud computing adoption. The study in Ghana was conducted on 305 organizations in different industries such as finance and banking, education, and government among others (Senyo et al., 2016), while Small and Medium Enterprises (SMEs) were investigated in Kenya (Tiren, 2017; Wambugu, 2018).

However, contrary to the above findings, trading partners' pressure was found to have an insignificant influence on the rate of cloud computing adoption in Saudi Arabia on a study conducted on different organizations. The respondents mentioned that other technologically related factors were of more concern, followed closely by competitive pressure among others (Alkhater et al., 2014). Another study conducted in Indonesia corroborates these findings (Gui et al., 2020). Therefore, it remains unclear whether trading partners' pressure would have a significant influence on the rate of cloud computing adoption especially when specifically considering commercial banks. As such, this study sought to examine how this construct influences the rate of cloud computing adoption by commercial banks in Kenya.

With reference to the above-mentioned studies and in the context of this study, trading partners' pressure was referred to as the intensity of pressure sensed from any customers and partners. It was respectively measured based on product competition, customer and supplier demands as referenced from previous studies (Gangwar et al., 2015; Gutierrez et al., 2015; Wambugu, 2018). Examples of trading partners include customers, inter-organizational channels, business partners and professional bodies among others (Gangwar et al., 2015; Gutierrez et al., 2015; Senyo et al., 2016; Wambugu, 2018).

2.3.3 Vendor support as an influencer of the rate of cloud computing adoption

Vendors in the context of cloud computing adoption are for example, cloud service providers, who are expected to ensure uninterrupted data and service availability (Gangwar et al., 2015). Their support has been noted to influence the rate of cloud computing adoption both positively and negatively due to the sensitivity of financial institutions with regard to quality products and service delivery to their customers. This support can be in terms of creating awareness on the technology, problem determination and resolution, data availability and security, and adhoc services such as customizations, among others (Chang et al., 2019; Gangwar et al., 2015; Gutierrez et al., 2015; Meshack, 2015; Misra & Doneria, 2018; Oredo et al., 2017; Scott et al., 2019; Senyo et al., 2016).

Vendor support allows financial institutions to be able to move non-critical services to the cloud and focus more on the business of financial service delivery. It enables banks to be able to only choose the required services and only pay for what they need, have a high level of fault tolerance, data protection and disaster recovery (Misra & Doneria, 2018; Oredo et al., 2017; Scott et al., 2019). In developing countries, vendor support-related issues involving data confidentiality, data security, quality of services and interoperability of standards in the banking sub-sector, have hugely impacted how financial institutions have adopted cloud computing. In India, a study

conducted in IT, manufacturing and finance sectors found that vendor support positively influenced cloud computing adoption, explaining an adoption rate of 62 percent (Gangwar, 2017; Gangwar et al., 2015). This is corrorated by other studies in Egypt and England (Alshamaila et al., 2013; Ayman et al., 2018; Zamani, 2022).

Additionally in Kenya, vendor support was shown as critical for creating awareness, providing support for clients on-boarded onto their cloud platforms and guaranteeing uptime (Tiren, 2017; Wambugu, 2018). However, contrary findings were obtained in Nigeria on a study conducted in the finance, IT, and manufacturing sectors (Abubakar et al., 2014). As the studies were targeted at other industries, coupled with the inconsistency in the findings, there still exists a gap since the findings may not be applicable to commercial banks in Kenya. Therefore, this study sought to examine how vendor support influences the rate of cloud computing adoption by commercial banks in Kenya.

Vendor support was referenced as the support available and offered for the technology adoption. It was respectively measured based on the nature and availability of security controls, self-service resources and lastly, technical and architectural support (Chang et al., 2019; Haryanto et al., 2020). Aspects such as awareness, availability of services, and security among others were considered within the questionnaire.

2.4 Research Gap

While various studies (Ali et al., 2020; Alkhater et al., 2014; Almubarak, 2017; Chang et al., 2019; Gangwar et al., 2015; Gutierrez et al., 2015; Jianwen & Wakil, 2020; Khayer et al., 2020; Sallehudin et al., 2015; Sayginer & Ercan, 2020; Tiren, 2017; Wambugu, 2018) have been conducted to assess the factors explicitly or implicitly influencing the rate of cloud computing adoption, there still exists different contradictory findings, contextual and methodological gaps. For example with regard to contradictory findings, competitive pressure which is a business environmental factor, was found to significantly influence adoption rates positively in studies conducted on various industries in India (Gangwar et al., 2015), Saudi Arabia (Alkhater et al., 2014), the UK (Gutierrez et al., 2015) and Iran (Jianwen & Wakil, 2020) because the respondents considered that the technology offered them competitive advantage. However, this is not consistent with other studies in similar industries in Bangladesh (Khayer et al., 2020), Saudi Arabia (Almubarak, 2017) and Turkey (Sayginer & Ercan, 2020) where other factors associated with the technology were found as significant positive influencers. Therefore, this study sought bridge this

gap by further assessing how business environmental factors such as competitive pressure influence the rate of cloud computing adoption by commercial banks in Kenya.

With regard to the contextual gaps, some of the studies (Alkhater et al., 2014; Gutierrez et al., 2015; Sayginer & Ercan, 2020; Tiren, 2017; Wambugu, 2018) considered respondents from various industries within a single study thus offering a broad view of the rate of cloud computing adoption. For example, a study in Kenya considered organizations in finance & investment, retail & consumer goods, agribusiness and construction & real estate (Tiren, 2017). While this offers good insight, it is limiting when seeking to understand the rate of adoption in specific industries thus highlighting a gap with existing literature.

In addition, some of the above-mentioned considered a qualitative methodology, such as two different studies conducted in Saudi Arabia on different industries. These included hospitals (Almubarak, 2017), manufacturing, engineering and energy (Alkhater et al., 2014). Aside from the studies being carried out on different industries excluding the banking sub-sector which is of interest in this study, there exists a methodological gap. This study was conducted on commercial banks and sought utilize a quantititative methodology to achieve it's aim.

Lastly, areas of further research were proposed for investigating business environmental factors in specific industry sectors and or sizes, different countries with consideration for different stakeholders since the factors may vary (Ali et al., 2020; Gutierrez et al., 2015; Meshack, 2015; Tiren, 2017). Therefore, in order to bridge the highlighted gaps, and based on the suggested areas of further research, this research sought to assess how business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya. A complete tabulated list of the research gaps matrix is included in **Appendix VI: Research Gap Matrix.**

2.5 Conceptual Framework

Based on previous literature (Ayman et al., 2018; Gangwar et al., 2015; Gutierrez et al., 2015; Oliveira et al., 2014; Oliveira & Martins, 2011; Senyo et al., 2016; Wambugu, 2018), the framework adopted factors that had been mentioned to significantly influence the rate of cloud computing adoption. The TOE framework provided the business environmental factors as independent variables while the DOI Theory provided a holistic measure of the rate of cloud computing adoption by commercial banks in Kenya. The conceptual framework in **Figure 2.1** shows the relationship between the dependent and the independent variables.

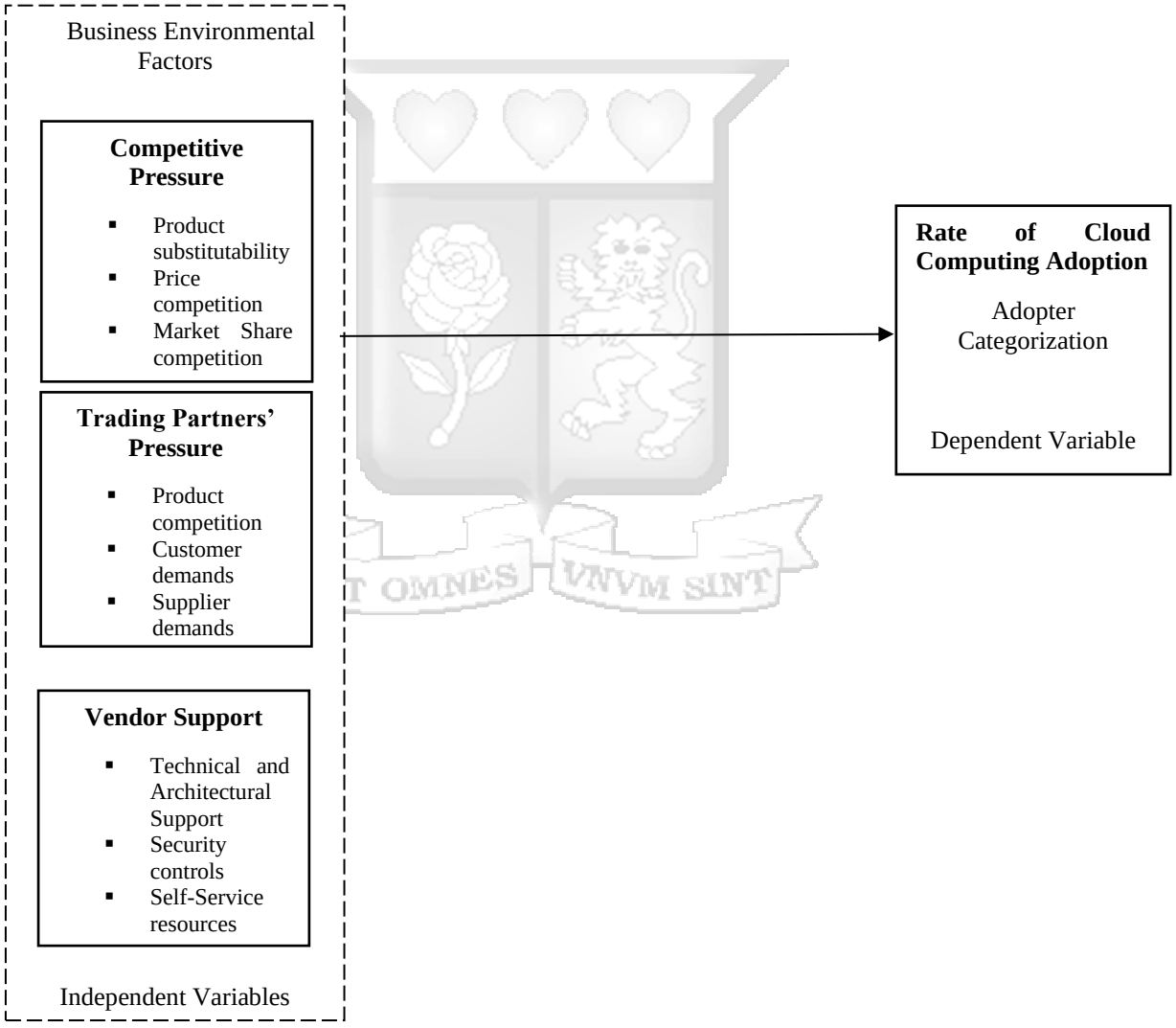


Figure 2.1 The conceptual framework

Table 2.1 below summaries the operationalization of variables;

Table 2.1 Summary of Conceptual Framework contexts and constructs

Supporting Theory	Context	Indicator or Construct	Definition in this Study	Measure & Scale of Measurement	Supporting Literature
TOE	Business Environmental Factors	Competitive Pressure **(Independent Variable)**	The intensity of pressure sensed from other rivals/competitors in the commercial banking subsector.	**Measure:** Product substitutability Price competition Market Share competition **Scale of Measurement:** Ordinal	(Gangwar et al., 2015; Gutierrez et al., 2015; Jianwen & Wakil, 2019; Khayer et al., 2020; Tiren, 2017; Wambugu, 2018)
		Trading Partners' Pressure **(Independent Variable)**	The intensity of pressure sensed from any customers and partners.	**Measure:** Product competition Customer demands Supplier demands **Scale of Measurement:** Ordinal	(Gangwar et al., 2015; Gutierrez et al., 2015; Jianwen & Wakil, 2019; Ming-Horng & Chieh-Yu, 2011; Wambugu, 2018)
		Vendor Support **(Independent Variable)**	The support available and offered for cloud computing adoption.	**Measure:** Technical and Architectural Support Security controls Self-Service resources **Scale of Measurement:** Ordinal	(Chang et al., 2019; Haryanto et al., 2020)
DOI	Rate of Cloud Computing Adoption	Rate of Cloud Computing Adoption **(Dependent Variable)**	The relative speed with which cloud computing is adopted by commercial banks in Kenya.	**Measure:** Adopter Categorization (.i.e. Innovators, Early Adopters and Majority, Late Majority, Laggards) **Scale of Measurement:** Ordinal	(Alkhater et al., 2014; Oliveira et al., 2014; Rogers, 2003; Sallehudin et al., 2015; Sayginer & Ercan, 2020)

CHAPTER 3 : RESEARCH METHODOLOGY

3.1 Introduction

The purpose of this study was to assess how the business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya. This chapter presents the research design to be used, the target population for the study and the sample size that were used. It also explains the data collection procedure, analysis and research instruments the study adopted. Lastly, it also focuses on the research quality and ethical considerations.

3.2 Research Philosophy

This research sought to achieve it's aim based on certain facets, that is, reliance on constructs of existing theories to discover any cause-and-effect relationships, analysis of the findings to prove or disprove those relationships through the study of a population and lastly, to draw conclusions that can be generalized. Additionally, the researchers' role was intended to be limited to collection of the relevant data and focusing on the facts for the objective interpretation of the findings thus maintain an independent view of the research findings. Therefore, based on these facets, this study adopted a positivism philosophy.

A positivism research philosophy emphasizes the discovery of observable and measurable data with human interpretation of the relationships therein (Saunders et al., 2019). The primary aim for the use of this philosophy was to give rise to explanatory links or relationships of a causal nature that lead to predictions in the specific research area. Furthermore, it posits that for generalizations of the findings to be made, large population samples should be considered for purposes of data consistency and adequate representation of the population of interest. In this way, this philosophy is centered on the verification of theories through the use of systemic controls for the replication of the findings based on the generalizations (Park et al., 2020).

A research philosophy has been described as the development of knowledge through a system of beliefs and assumptions. (Saunders et al., 2019). It's purpose is to define the beliefs that will guide the research design, data collection and analysis of the topic (Ryan, 2018).

3.3 Research Design

This study, whose aim was to assess how the business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya, utilized a descriptive design to assess the research objectives. This design was used because the study aimed at examining of how each

of the objectives influences the rate of cloud computing adoption which involved the collection of survey data associated with the respective variables observed and measured in their natural setting. As such, a descriptive design is defined as one that seeks to gather data that describes the phenomena in it's natural setting without manipulation of the research context and subsequently, summarizes, interprets and presents the information (Gacengechi, 2016; Munya, 2017). The research design has been defined as a blueprint for the collection, measurement, and analysis of data (Saunders et al., 2019).

Additionally, for each of the three objectives being evaluated as influencers of the rate of cloud computing adoption, that is, competitive pressure, trading partners' pressure and vendor support, were tested using statistical methods of analysis. This analysis is meant to provide an accurate correlation between the variables indicated in the conceptual framework, thus permitting inferences about causality to be made with minimal bias and maximum reliability.

3.4 Population and Sampling

The target population in this research included commercial banks licensed under the Kenyan Banking Act by the Central Bank of Kenya as at 31 December 2022 (Central Bank of Kenya, 2022a). These comprised of the 39 commercial banks, which are either owned privately (37) or publicly (2) in a census approach. The study sought to focus on the final consumer or customer of the technology, in this case the commercial banks, and how business environmental factors influence their rate of adoption as a foundation for future studies. Limitations in terms of time and budget offer additional restrictions on why other respondents such as suppliers of cloud services, cloud providers, policy makers/regulators, were left out of the study.

The unit of analysis was a decision-maker or manager within the technology, operations and strategy departments or similar relevant department in the commercial banks. The decision-maker or manager had the applicable knowledge of their respective organizations and influenced or was the key stakeholder in the cloud computing adoption process. Additionally, as the mentioned departments are typically aware and involved in decisions made relating to technology and any influences impacting the banks from the business environment respectively, they provided the appropriate data for this study.

The sampling frame was all the 117 decision-makers as shown in **Table 3.1** and the survey research strategy utilizing structured questionnaires as the research instrument was used. This enabled the derivation of comparable data across the specified target population.

Table 3.1 Target Population

Position	Number of banks in Kenya	Number of Personnel
Head of Strategy or Strategy decision maker	39	39
Head of Operations or Operations decision maker	39	39
Head of IT or IT decision maker	39	39
Target Population		**117**

3.5 Data Collection Methods

This research relied on primary and secondary data. Primary data enabled the collection of up-to-date data specific to the fulfilment of the objectives of this research from original sources while the secondary data provided additional industry insights and offered support or new insights for views derived from primary data.

The primary data was collected using an structured questionnaire based on research questions utilizing on a 5-point Likert Scale. The questionnaire was developed by the researcher with reference to previously conducted research in similar areas of study (Ali et al., 2020; Gangwar et al., 2015; Gutierrez et al., 2015; Ming-Horng & Chieh-Yu, 2011; Oliveira et al., 2014; Wambugu, 2018) and was administered by trained research assistants. The questionnaire had different parts, the first two parts sought to obtain general information about the respondent such as their role, if they had deployed cloud computing or not and in which department among others. The subsequent sections of the questionnaire sought to obtain information that was specific to the research objectives and constructs, that is, competitive and trading partners' pressure, vendor support, and the rate of cloud computing adoption.

With regard to the first objective, competitive pressure as an influencer of the rate of cloud computing adoption, data associated with the decision-makers' understanding of the potential competitive advantage offered by the technology and if other competitors in the market had adopted it, thus possibly increasing the pressure for adoption. The section also sought to gather data on respondent's understanding of cloud adoption as it related to the achievement of likely higher profits.

The decision-makers likewise provided data associated with their trading partners', that is, if changes in the requirements and demands of their customers and partners such as mobile network

operators, utility companies, were exerting pressure on the banks to adopt cloud computing. This data was used to analyse to what degree trading partners' pressure was influencing the rate of cloud computing adoption.

Additionally, data related to the third objective addressed the extent and nature of support vendors were offering with regard to cloud computing adoption. The IT decision-makers provided data about the information typically provided about cloud services, vendor competencies, security, and if the necessary architectures and controls were in-place from a vendor support perspective. Lastly they also provided data about the possible timeframes being considered, if at all, for adoption of cloud computing.

Secondary data from survey reports and previously conducted research such as relates to trends in the banking industry was also utilized for all three objectives. The source for this data was the local regulator, CBK.

3.6 Data Analysis and Presentation

This study used the quantitative method of data analysis, that is, both descriptive and inferential statistics to describe the characteristics of the data collected and to affirm whether any correlations or relationship between the independent and dependent variables had been observed. The collected data was thoroughly examined and checked for completeness and comprehensiveness.

The types of descriptive statistics used included distribution, central tendency and variability. Distribution tables were used to summarize the findings associated with the demographic data of the respondents based on frequencies, for example, gender and years of experience. Additionally, measures of central tendency such as mean, were used to estimate the average or center of the data sets collected, while measure of variability like standard deviation provided an understanding of the spread of the data collected. The measures of central tendency and variability were applied to all the independent variables.

Inferential statistics was used to make inferences about the data collected. As such, different statistical tests were conducted, that is, correlation tests to determine the extent to which the business environmental constructs were related to the rate of cloud computing adoption. As well as regression tests (ordinal logistic regression) to determine the relationship between the independent and dependent variables.

Presentation of the findings for both the descriptive and inferential statistics was done by the use of pie charts, bar charts, graphs, and frequency tables. The main aim was to ensure that the gathered

information was clearly depicted for ease of understanding. The analyzed data were reported on three main classifications which included a summary of main findings, conclusions and recommendations.

With regard to the secondary data, relevant institutions such as the local regulator's published studies were considered by assessing the relevance of the available data in the context of the research objectives of this study. The data's value was further assessed, that is, the quality of the studies undertaken. For example, if there appeared to be any form of bias. Lastly, an assessment of if the data considered was sufficient was done.

3.7 Research Quality

As guided by the four key factors that determine research quality: internal validity, external validity, reliability, and objectivity, the research aimed to have an objective outcome. Internal validity is defined as the extent to which findings can be attributed to interventions instead of any limitations in your research while external validity refers to the generalisability of a particular study to all relevant circumstances (Saunders et al., 2019). In order to test validity, piloting or the use of a pre-test was used on sample respondents from non-deposit taking institutions, specifically the insurance industry, which are also classified within the financial services sector (Central Bank of Kenya, 2020a).

In addition to the above, the validity of the constructs was tested using the Keyser Meyer Olkin (KMO) and the Bartlett's test of Sphericity as used by other similar studies (Kirui, 2022; Phuthong, 2022; Tiren, 2017). These tests are used to verify whether the data is suitable for factor analysis which is meant to discover any underlying association in factors and therefore, reduce the number of involved factors by allowing for groupings. With the minimum acceptable value for the KMO being 0.5 and the Bartlett's test of Sphericity of less than 0.05, then it can be concluded that the construct measures what it intends to measure. The results for the above-mentioned values for each construct are as shown in in **Table 3.2** below.

Table 3.2 Construct Validity

Variable	KMO Value	Bartlett's Test of Sphericity
Competitive Pressure	0.608	0.000
Trading Partners' pressure	0.809	0.000
Vendor Support	0.623	0.000
Rate of Cloud Computing	0.500	0.000

Source: Primary data (2023)

The results in **Table 3.2** show that competitive pressure had a KMO value of 0.608 and Bartlett's test of Sphericity of 0.000 which is less than 0.05, implying the associated statements are valid. The KMO values of trading partners' pressure and vendor support are 0.809 and 0.623 respectively while their Bartlett's test of Sphericity is 0.000 which is significant as it is less than 0.05. Lastly, for rate of cloud computing the KMO value is 0.500 and it's Bartlett's test of Sphericity is 0.000 which implies that for this construct as well as the others, they measured what they intended to measure.

Reliability relates to consistency in findings obtained when an instrument is used each time (Cronbach, 1951; Saunders et al., 2019). In order to measure the reliability of the research instrument, the Cronbach's alpha was calculated as it has been utilized in previous studies for verification of internal consistency. Results above 0.6 are considered acceptable while those above 0.7 are considered reliable (Gangwar, 2017; Kirui, 2022; Phuthong, 2022; Wambugu, 2018). The results obtained with the aid of Statistical Package for the Social Sciences (SPSS) showed that rate of cloud computing had a Cronbach's Alpha of 0.621, vendor support of 0.676 and competitive and trading partners' pressure had Cronbach's Alpha of 0.706 and 0.851 respectively. These results imply that the items associated with rate of cloud computing and vendor support are acceptable while those for competive and trading partners' pressure were reliable.

3.8 Ethical Considerations

Before conducting any data collection, approval was sought from the Strathmore University Ethical Review Board and the National Commission for Science, Technology and Innovation, as seen in **Appendix I: Ethical Approval Letter** and **Appendix II: National Commission for Science, Technology and Innovation (NACOSTI) Research Permit**. The same approval was shared with respondents along with other assurances of confidentiality and anonymity. The respondents were informed of the objectives of the study and the liberty to choose which questions to respond to or not. All responses were kept confidential.

CHAPTER 4 : PRESENTATION OF RESEARCH FINDINGS

4.1 Introduction

The purpose of this study was to assess how the business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya. This chapter presents the research findings as follows, response rate of the study, demographic information, descriptive and inferential statistics as they relate to the objectives of the study.

4.2 Response Rate

The study targeted 117 decision makers from three departments, that is, strategy, operations and IT in all the 39 commercial banks in Kenya. Out of the 117 administered, 73 were fully filled and returned while 44 were not returned. The summary of the response rate is depicted in **Figure 4.1**.

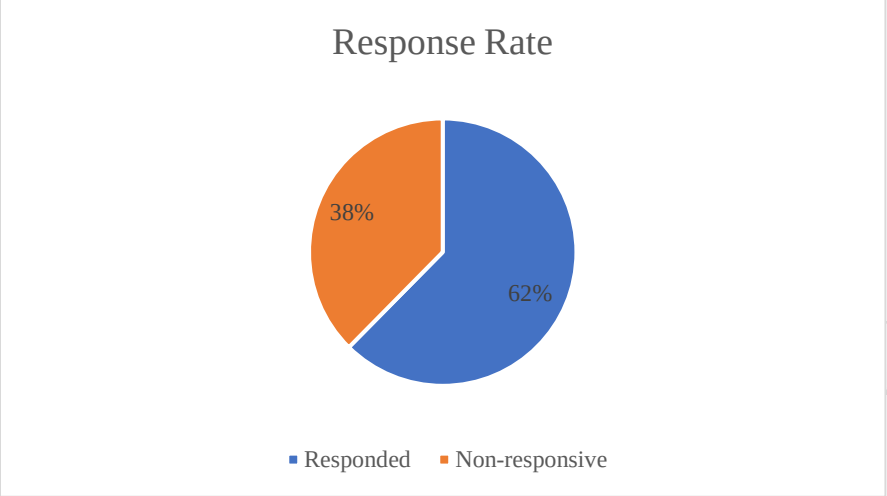


Figure 4.1 Response Rate

Source: Primary data (2023)

Based on the results in **Figure 4.1**, the response rate of the study was 62% . According to previous studies (Kothari & Garg, 2019), a response rate of above 50% is acceptable for analysis and reporting.

4.3 Demographic Information

The demographic information collected provided the general characteristics of the population including the gender and age bracket of the respondents, the duration they had worked at their

respective institutions and lastly, the classification of respondents role with regard to cloud computing. **Table 4.1** below shows a summary of the findings.

Table 4.1 Demographic Information

Demographic Information	**Category**	**Frequency**	**Percentage**
Gender of the Respondents	Male	42	58%
	Female	31	42%
Age Bracket of the Respondents	Below 24 years	6	8%
	24 – 30 years	17	23%
	31 – 35 years	27	37%
	36 - 40 years	11	15%
	41 - 45 years	8	11%
	46 - 50 years	4	5%
Duration respondents had worked for the respective commercial banks	Less than 1 year	4	5%
	1 to 3 years	17	23%
	4 to 5 years	28	38%
	6 to 7 years	17	23%
	More than 7 years	7	10%
Classification of respondents role with regard to cloud computing	Responsible	13	18%
	Accountable	27	37%
	Consulted	9	12%
	Informed	24	33%
Departments of the respondents	Strategy	17	23%
	Operations	10	14%
	IT	35	48%
	Others (Did not Specify)	11	15%

Source: Primary Data (2023)

The results show that 58% of the respondents were male thus making up the majority of the respondents. The females accounted for 42% of the respondents which although lower than the representation of the males is not widely inbalanced. This implies that the study findings are fairly balanced across gender.

A significant number of the respondents, that is, 37% were aged between 31 and 35 years while those above 46 years and below 24 years accounted the lowest representation of 5% and 8%

respectively. This implied a good level of maturity, competence and the ability to keep abreast with technological innovations.

The majority of the respondents, that is, 38%, were found to have worked at their respective organizations for 4 to 5 years. These were closely followed by those respondents who had worked between 1 to 3 years and 6 to 7 years, each at a percentage of 23%. Cummulatively, these three categories represented 85% of the respondents, which indicated that they would have a good understanding of their organizations, and thus were able to provide accurate information as relates to this study.

With regard to the classification of roles as relates to cloud computing, majority of the respondents, that is, 37% stated that they were accountable for cloud computing within their organizations. These were closely followed by those who were informed at 33%, responsible at 18% and lastly, consulted at 12%. Based on the findings, it was found that cummulatively 67% of the respondents are either responsible or accountable or consulted, and thus, would have the necessary influence as key stakeholders in the cloud computing adoption process.

Majority of the respondents, that is, 48%, were from the IT department and were closely followed by those in the Strategy and Operations departments at 23% and 14% respectively. Given that this study relates to adoption of a technology, it is representative that the majority of the respondents would be from the IT department. However, the other two departments, that is, strategy and operations also provided a cumulative representation of 37% which implies that the results are balanced and give a good representation. Lastly, a certain number of the respondents, that is, 11, which accounts for 15% of the total respondents chose not to indicate their department which is acceptable by the Strathmore University ethical standards. The standards state that respondents should choose which questions to respond to or not.

4.4 General Information on Cloud Computing Adoption

The respondents were requested to provide general information on cloud computing with respect to their respective organizations prior to responding to the questions related to the objectives of the study. This information included aspects such as if the organizations had an existing IT strategy, if cloud computing was included in that strategy or not, the cloud service and deployment models currently deployed. This information was meant to give a background understanding on what level of importance cloud computing had within the commercial banks and what aspects of the technology were in use, if any. **Table 4.2** below provides a summary of some of the findings obtained while the rest are included in the subsequent paragraphs.

Table 4.2 General Information on Cloud Computing

Question	Response	Frequency	Percentage
Does your organization have an IT strategy?	Yes	72	99%
	No	1	1%
Does your IT strategy or plans include cloud computing as an existing technology to utilize?	Yes	67	92%
	No	6	8%
Does your IT strategy or plans include cloud computing as a technology to utilize in the future?	Yes	69	95%
	No	4	5%
What was your initial level of preparedness for the adoption of cloud computing?	Very Low	2	3%
	Low	7	10%
	Moderate	20	27%
	High	33	45%
	Very High	11	15%
What service model(s) is currently implemented in your organization?	IaaS	21	29%
	SaaS	37	51%
	PaaS	8	11%
	Not Applicable	5	7%
	No response	2	3%
What deployment model(s) is currently implemented in your organization?	Public Cloud	12	16%
	Private Cloud	16	22%
	Community Cloud	11	15%
	Hybrid Cloud	29	40%
	Not Applicable	3	4%
	No response	2	3%
Kindly rate your level of satisfaction with the cloud computing services being consumed	Dissatisfied	5	7%
	Neutral	14	19%
	Satisfied	38	52%
	Very satisfied	14	19%
	No response	2	3%

Source: Primary Data (2023)

Based on the results from the respondents, 99% stated that their respective organizations had existing IT strategies, while only 1% indicated they do not have. This indicates that for majority

of the commercial banks, the objectives and goals of which technologies or processes will or are implemented as aligned with their business strategy have been articulated and documented. Additionally, it was found that for 92% and 95% of the respondents, cloud computing was included as a technology for use at the time and in the future respectively. The minority of respondents, that is, 8% and 5% stated they were not utilizing the technology at the time in their IT strategies or in the future. This implied that for majority of the commercial banks, cloud computing was either in use or planned to be utilized in the future.

With regard to the service models of cloud computing, it was found that 51% of the respondents have implemented SaaS, 29% had IaaS while 11% had PaaS, which cumulatively accounts for 90% of the total number of respondents. This implies that majority of the commercial banks prefer the efficiency offered by SaaS models in terms of reduction in the resources like time, spent by the technology departments as well as improved service uptime. Additionally, majority of the respondents, that is, 40%, indicated that they utilized the hybrid cloud deployment model. These were closely followed by those who utilized private cloud at 22%, public cloud at 16%, and lastly, those who utilized community cloud at 15%. This indicated that majority of the commercial banks had some services within their premises and others on the cloud, thus no need to control everything. However, as is acceptable by the Strathmore University ethics standards, a minority of the respondents, that is, 3%, opted to provide no response to either questions on the service or deployment models.

Majority of the respondents, that is, 52%, indicated they were satisfied with the cloud services they were consuming, while 19% were very satisfied or neutral about the same services. A minority of 7% stated they were dissatisfied with the services while 3% provided no response. When considered cumulatively, it was noted that 71% of the respondents were satisfied or very satisfied with cloud services which indicates that it fulfils their needs or expectations. Additionally, 60% of the respondents cumulatively stated they had a high (45%) and very high (15%) initial preparedness for the adoption of cloud computing in their organizations. 27% of the respondents stated they were moderately prepared, while the rest indicated they had low and very low initial preparedness at 10% and 3% respectively. As majority of the respondents had high or very high initial preparedness when related to the satisfaction levels, it showed that due to the good initial preparedness, the commercial banks were able to fulfil their needs.

In addition, the respondents were asked to what extent certain aspects influenced their decision to adopt cloud computing and it was found that for majority, that is, 74%, improved service

availability was critical. This was closely followed the flexibility in cost structures at 67%, the potential to reduce operational costs at 66% and lastly, the ability to scale resources on demand at 63%. This indicated that indeed the IT departments are aligned with the respective business strategies as is depicted by the significance of service availability. On the contrary, the reasons for not adopting cloud computing by the respondents included a lack of finances, threat of vendor lock-in and a lack of knowledge on cloud computing each at 53%. Additionally, reasons provided were a lack of in-house skills at 51%, a lack of management and leadership support at 47%, incompatibility with existing IT landscape at 45%, regulatory compliance at 44%, those who perceived no tangible benefits at 40% and lastly, challenges with business continuity at 38%. It can be noted that the reasons range from internal to external issues with the results obtained from Likert scales where respondents were asked to provide responses ranging from strong agreement to strong disagreement.

4.5 Research Findings Based on the Objectives of this Study

This section includes the research findings based on the objectives of the study. It includes the descriptive and inferential statistics as well as factor analysis.

4.5.1 Competitive Pressure as an influencer of the rate of cloud computing adoption

A structured questionnaire with a Likert scale was utilized to obtain responses from the respondents. The scale provisioned for responses of 1 to 5 with 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. The following sub-sections summarize the findings obtained and depicted with use of descriptive statistics and factor analysis.

4.5.1.1 Descriptive Statistics on Competitive Pressure

This section includes the findings on the descriptive statistics on competitive pressure (CP) as the first objective of this study. **Table 4.3** below shows the summary of the findings presented using mean and standard deviation.

Table 4.3 Descriptive Statistics on Competitive Pressure

Statements	Mean	Std. Deviation
It's easy for our customers to switch to another bank for similar products/services without much difficulty.	3.243	0.970
Competition in our industry has driven our organization towards the use of cloud-based services.	3.571	1.030

Statements	Mean	Std. Deviation
Price Competition in our industry has driven our organization towards the use of cloud-based services	3.371	1.119
Market Share Competition for (certain) products/services in our industry has driven our organization towards the use of cloud-based services	3.557	0.958
We intend to leverage cloud computing as a technology for innovation (or other use-cases) to increase our market share for (certain) products/services	3.700	0.857
We intend to leverage cloud computing as a technology for innovation (or other use-cases) to create new products/services	3.486	0.974
We understand the competitive advantages offered by cloud computing in our industry	3.814	0.967
Cloud would increase our ability to outperform the competition thus gain competitive advantage	3.614	0.889
Average	**3.545**	**0.970**

Source: Primary Data (2023)

Based on the results in **Table 4.3**, the respondents agreed that they intended to leverage cloud computing as a technology for innovation to increase their market share for products or services as shown by the mean of 3.700 and standard deviation of 0.857. They agreed that the technology would increase their ability to outperform their competition thus allow them to gain a competitive advantage as shown by the mean of 3.614 and standard deviation of 0.889. Furthermore, they agreed that they were driven to utilize the technology so as to grow their market share for (certain) products or services in their industry (mean = 3.557, std deviation = 0.958) with the understanding of the competitive advantage offered by cloud computing (mean = 3.814, std deviation = 0.967) and the capability it offered to be leveraged as a technology for innovation (or other use-cases) to create new products/services (mean = 3.486, std deviation = 0.974). Lastly, they agreed that it was easy for their customers to switch to other banks for similar products or services without much difficulty (mean = 3.243, std deviation = 0.970) and that, price competition (mean = 3.371, std deviation = 1.119) as well as competition in general within the industry had driven their organizations towards the use of cloud-based services (mean = 3.571, std deviation = 1.030). Thus, the commercial banks perceived that when cloud computing adoption offered some form of competitive advantage either through innovation or price or market share, they were more likely to adopt cloud computing.

Additionally, based on the latest innovation survey conducted by CBK in 2022, cloud computing was highlighted as one of the initiatives being undertaken by commercial banks and mortgage finance institution to facilitate innovation activities. It stated that 74% of the respondents highlighted the changing competitive environment, that is, the need to strengthen their business models and have a competitive advantage over their peers, as another factor. The Kenyan Banking Sector Innovation Survey 2022 was conducted in February 2023 and included respondents from all 39 banks. The survey is conducted annually "to understand the trend and impact of digitization in the banking sector to inform appropriate policy decisions". It has previously been conducted in 2018, 2019, 2020 and 2021 (Central Bank of Kenya, 2022b). This was aligned with the findings from the primary data and affirmed that competitive pressure was an influencer of the rate of cloud computing.

4.5.2.2 Factor Analysis on Competitive Pressure

Exploratory factor analysis was carried out on each of the variables of the study to investigate and determine any underlying associations between the variables. It was also utilized to reduce the number of variables into smaller groups for more in-depth analysis.

The Keyser Meyer Olkin (KMO) which measures if the responses are adequate and the Bartlett's test of Sphericity which measures the relationship strength between the variables, were utilized to verify the suitability of the data for factor analysis. These tests were run on all 8 factors within competitive pressure as an influencer of the rate of cloud computing, and the KMO obtained was 0.608 while the Bartlett's test of Sphericity yielded a value of 0.000 which is less than 0.05. This indicates that factor analysis can be carried out as the KMO value is above the minimum of 0.5 (Kaiser, 1974) and Bartlett's test of Sphericity less than 0.05. **Table 4.4** below shows the summary of total variance explained.

Table 4.4 Competitive Pressure Factor Analysis - Total Variance Explained

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.779	34.736	34.736	2.779	34.736	34.736	2.493	31.157	31.157
2	1.773	22.164	56.899	1.773	22.164	56.899	1.805	22.559	53.716
3	1.043	13.037	69.936	1.043	13.037	69.936	1.298	16.221	69.936
4	.780	9.754	79.690						
5	.602	7.531	87.221						

6	.529	6.608	93.829						
7	.288	3.597	97.426						
8	.206	2.574	100.000						

Extraction Method: Principal Component Analysis.

Source: Primary Data (2023)

The method of factor extraction utilized was Principal Components Analysis as it utilizes all the variance of the data without making any reference to prior information on the categorizations of the data. Based on the results shown in **Table 4.4**, the first three components with an Eigenvalue greater than 1 were considered significant (Kirui, 2022; Matsunaga, 2010; Tiren, 2017) and they were noted to account for 34.736%, 22.164% and 13.037% of the variance with the other factors. When rotated with varimax rotation, the rotation sums of squared loadings were 31.157%, 53.716% and 69.936%. Thus implying that the three components can effectively represent all the eight components. The three components are the ease for their customers to switch to other banks for similar products/services without much difficulty, competition and more specifically price competition in the industry have driven their organizations towards the use of cloud-based services. These were further analysed with inferential statistics as shown in Section **4.5.5 Inferential Statistics**.

The rotated component matrix shown in **Table 4.5** below was extracted to ease the interpretation of the analysis. However, variables with factor loading less than 0.4 were suppressed as recommended by other studies (Kirui, 2022; Matsunaga, 2010), while those equal to or greater than 0.4 were retained for further analysis. These results are shown in **Table 4.6** below.

Table 4.5 Competitive Pressure Factor Analysis - Rotated Component Matrix

Rotated Component Matrix

	Component		
	1	2	3
It's easy for our customers to switch to another bank for similar products/services without much difficulty.	.729	.407	-.111
Competition in our industry has driven our organization towards the use of cloud-based services.	.857	.203	.022
Price Competition in our industry has driven our organization towards the use of cloud-based services	.816	.032	-.019

Market Share Competition for (certain) products/services in our industry has driven our organization towards the use of cloud-based services	.724	-.155	.094
We intend to leverage cloud computing as a technology for innovation (or other use-cases) to increase our market share for (certain) products/services	.061	.772	.082
We intend to leverage cloud computing as a technology for innovation (or other use-cases) to create new products/services	.136	.829	.057
We understand the competitive advantages offered by cloud computing in our industry	.067	.007	.943
Cloud would increase our ability to outperform the competition thus gain competitive advantage	-.090	.538	.614

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

Source: Primary Data (2023)

The results shown in **Table 4.6** depict the factors with factor loadings equal to or greater than 0.4. These factors were further categorized into certain suggested themes which include the competitive forces in the industry, innovation and competitive advantage.

Table 4.6 Competitive Pressure Factor Analysis - Themes derived

Component	Factors	Coeefficient	Suggested Themes
1	It's easy for our customers to switch to another bank for similar products/services without much difficulty.	0.729	Competitive Forces in the Industry
	Competition in our industry has driven our organization towards the use of cloud-based services.	0.857	
	Price Competition in our industry has driven our organization towards the use of cloud-based services	0.816	
	Market Share Competition for (certain) products/services in our industry has driven our organization towards the use of cloud-based services	0.724	

Component	Factors	Coeefficient	Suggested Themes
2	We intend to leverage cloud computing as a technology for innovation (or other use-cases) to increase our market share for (certain) products/services	0.772	Innovation
	We intend to leverage cloud computing as a technology for innovation (or other use-cases) to create new products/services	0.829	
	It's easy for our customers to switch to another bank for similar products/services without much difficulty.	0.407	
	Cloud would increase our ability to outperform the competition thus gain competitive advantage	0.538	
3	We understand the competitive advantages offered by cloud computing in our industry	0.943	Competitive Advantage
	Cloud would increase our ability to outperform the competition thus gain competitive advantage	0.614	

Source: Primary Data (2023)

4.5.2 Trading Partners' Pressure as an influencer of the rate of cloud computing adoption

A structured questionnaire with a Likert scale was utilized to obtain responses from the respondents. The scale provisioned for responses of 1 to 5 with 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. The following sub-sections summarize the findings obtained and depicted with use of descriptive statistics and factor analysis.

4.5.2.1 Descriptive Statistics on Trading Partners' Pressure

This section includes the findings on the descriptive statistics on trading partners' pressure (TPP) as the second objective of this study. **Table 4.7** below shows the summary of the findings presented using mean and standard deviation.

Table 4.7 Descriptive Statistics on Trading Partners' Pressure

Statements	Mean	Std. Deviation
Our trading partners offer competitive products hosted only on cloud platforms, thus we are being pressured to adopt cloud computing	3.329	1.018
Changes in customer behavior and demands are pressuring us to adopt cloud computing	3.229	1.206

Changes in other trading partners' requirements and demands are pressuring us to adopt cloud computing. Examples of such trading partners include mobile network operators, utility companies, professional or international affiliates like SWIFT (Society for Worldwide Interbank Financial Telecommunication) etc.	3.371	1.038
We adopted cloud computing because some of the products or services offered by our trading partners are only offered on the cloud	3.357	1.130
Average	**3.321**	**1.098**

Source: Primary Data (2023)

Based on the results in **Table 4.7**, the respondents agreed that they were pressured to adopt cloud computing because their trading partners offered competitive products hosted only on cloud platforms which they had to consume as shown by the mean of 3.329 and standard deviation of 1.018. Additionally, these partners such as mobile network operators, utility companies, professional or international affiliates like SWIFT (Society for Worldwide Interbank Financial Telecommunications), with their changing requirements (mean = 3.371, std deviation = 1.038) or demands that some of their products or services are only offered on the cloud (mean = 3.357, std deviation = 1.130) were pressuring the commercial banks to adopt cloud computing. Lastly, they agreed that changes in customer behavior and were pressuring them to adopt cloud computing as shown by the mean of 3.229 and standard deviation of 1.206. Thus, the commercial banks as a result of their partnerships with different trading partners whom they rely on (such as customers) or work with for example to make the products more accessible (such as mobile network operators), were pressured to adopt cloud computing to fulfil any changing requirements or demands.

Additionally, based on the latest innovation survey conducted by CBK in 2022, cloud computing was highlighted as one of the initiatives being undertaken by commercial banks and mortgage finance institution to facilitate innovation activities. It stated that 85% of the respondents indicated that changing customer behaviour was impacting their ability and willingness to innovate (Central Bank of Kenya, 2022b). This was aligned with the findings from the primary data and affirmed that trading partners' pressure was an influencer of the rate of cloud computing.

4.5.2.2 Factor Analysis on Trading Partners' Pressure

Exploratory factor analysis was carried out on this variable to investigate and determine any underlying associations with the other variables and to reduce the number of variables into smaller groups where possible for more in-depth analysis. The Keyser Meyer Olkin (KMO) and the

Bartlett's test of Sphericity, were utilized to verify the suitability of the data for factor analysis. These tests were run on all 4 factors within trading partners' pressure as an influencer of the rate of cloud computing, and the KMO obtained was 0.809 while the Bartlett's test of Sphericity yielded a value of 0.000 which is less than 0.05. This indicates that factor analysis can be carried out, as the KMO value is above the minimum of 0.5 (Kaiser, 1974) and Bartlett's test of Sphericity less than 0.05. **Table 4.8** below shows the summary of total variance explained.

Table 4.8 Trading Partners' Pressure Factor Analysis - Total Variance Explained

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.773	69.330	69.330	2.773	69.330	69.330
2	.513	12.822	82.152			
3	.399	9.975	92.127			
4	.315	7.873	100.000			

Extraction Method: Principal Component Analysis.

Source: Primary Data (2023)

The method of factor extraction utilized was Principal Components Analysis as it utilizes all the variance of the data without making any reference to prior information on the categorizations of the data. Based on the results shown in **Table 4.8**, only the first component that had an Eigenvalue greater than 1 was considered significant and was noted to account for about 69% of the variance. Thus implying that the this one component, that is, the commercial bank trading partners offer competitive products hosted only on cloud platforms, thus pressuring them to adopt cloud computing, can effectively represent all the four components. Further analysis was conducted with inferential statistics as shown in Section **4.5.5 Inferential Statistics**.

The rotated component matrix shown in

Table 4.9 below was extracted to ease the interpretation of the analysis. Further analysis was conducted to determine if any of the variables had factor loading less than 0.4 so as to suppress them, however, all were found to be greater than 0.4 and were retained for additional study.

Table 4.9 Trading Partners' Pressure Factor Analysis - Rotated Component Matrix

Component Matrix[a]

	Component 1
Our trading partners offer competitive products hosted only on cloud platforms, thus we are being pressured to adopt cloud computing	.844
Changes in customer behavior and demands are pressuring us to adopt cloud computing	.860
Changes in other trading partners' requirements and demands are pressuring us to adopt cloud computing. Examples of such trading partners include mobile network operators, utility companies, professional or international affiliates like SWIFT (Society for	.788
We adopted cloud computing because some of the products or services offered by our trading partners are only offered on the cloud	.838

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Source: Primary Data (2023)

4.5.3 Vendor support as an influencer of the rate of cloud computing adoption

A structured questionnaire with a Likert scale was utilized to obtain responses from the respondents. The scale provisioned for responses of 1 to 5 with 1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree. The following sub-sections summarize the findings obtained and depicted with use of descriptive statistics and factor analysis.

4.5.3.1 Descriptive Statistics on Vendor Support

This section includes the findings on the descriptive statistics on vendor support (VS) as the third objective of this study. **Table 4.10** below shows the summary of the findings presented using mean and standard deviation.

Table 4.10 Descriptive Statistics on Vendor Support

Statements	Mean	Std. Deviation
Vendors provide access to 24/7 cloud support irrespective of severity of the cases	3.714	0.801
Vendors provide Third-Party Software Support, that is, interoperability and configuration guidance and troubleshooting	3.643	0.781
Vendors provide architectural support for both general cases and specific use-cases	3.843	0.715

Statements	Mean	Std. Deviation
Vendors have implemented the recommended security controls such as access and identity management, and monitoring capabilities	3.714	0.854
Vendors have implemented the recommended controls for data privacy and confidentiality	3.857	0.748
Vendors provide 24/7 Self-Help Resources such as documentation, whitepapers, how-to-videos for use of the cloud platforms	3.886	0.790
Vendors provide sufficient information about the available cloud-based services through trainings, online laboratories etc	3.943	0.759
Vendors provide 24/7 proactive and self-service options such as automation workflows and reviews, Centralized management of all resources, guidance for provisioning of resources according to best practices etc	3.900	0.705
Average	**3.813**	**0.769**

Source: Primary Data (2023)

Based on the results in **Table 4.10**, the respondents agreed that they were more likely to adopt cloud computing if the respective cloud vendors provided 24/7 proactive and self-service options (mean = 3.900, std deviation = 0.705), architectural support for both general cases and specific use-cases (mean = 3.843, std deviation = 0.715), implemented the recommended controls for data privacy and confidentiality (mean = 3.857, std deviation = 0.748), and provided sufficient information about the available cloud-based services through trainings etc. as shown by the mean of 3.943 and standard deviation of 0.759. Furthermore, they agreed that provision of 24/7 self-help resources (mean = 3.886, std deviation = 0.790), third-party software support (mean = 3.643, std deviation = 0.781), and access to 24/7 cloud support irrespective of severity of the cases (mean = 3.714, std deviation = 0.801) influenced their adoption of cloud computing. Lastly, the respondents agreed that if the cloud vendors had implemented the recommended security controls such as access and identity management, and monitoring capabilities, they would potentially adopt cloud computing as shown by the mean of 3.714 and standard deviation of 0.854. Thus, the commercial banks were more likely to adopt cloud computing due to the support offered by cloud vendors.

4.5.3.2 Factor Analysis on Vendor Support

Exploratory factor analysis was carried out on this variable to investigate and determine any underlying associations with the other variables and to reduce the number of variables into smaller groups where possible for more in-depth analysis. The Keyser Meyer Olkin (KMO) and the

Bartlett's test of Sphericity, were utilized to verify the suitability of the data for factor analysis. These tests were run on all 8 factors within vendor support as an influencer of the rate of cloud computing, and the KMO obtained was 0.623 while the Bartlett's test of Sphericity yielded a value of 0.000 which is less than 0.05. This indicates that factor analysis can be carried out, as the KMO value is above the minimum of 0.5 (Kaiser, 1974) and Bartlett's test of Sphericity less than 0.05. **Table 4.11** below shows the summary of total variance explained.

Table 4.11 Vendor Support Factor Analysis - Total Variance Explained

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.557	31.961	31.961	2.557	31.961	31.961	1.793	22.407	22.407
2	1.306	16.327	48.288	1.306	16.327	48.288	1.764	22.052	44.459
3	1.068	13.352	61.641	1.068	13.352	61.641	1.375	17.182	61.641
4	.881	11.012	72.653						
5	.788	9.850	82.503						
6	.594	7.421	89.925						
7	.468	5.852	95.777						
8	.338	4.223	100.000						

Extraction Method: Principal Component Analysis.

Source: Primary Data (2023)

The method of factor extraction utilized was Principal Components Analysis as it utilizes all the variance of the data without making any reference to prior information on the categorizations of the data. Based on the results shown in **Table 4.11**, the first three components with an Eigenvalue greater than 1 were considered significant and they were noted to account for 31.961%, 16.327% and 13.352% of the variance with the other factors. When rotated with varimax rotation, the rotation sums of squared loadings were cumulatively 22.407%, 44.459% and 61.641%. Thus implying that the three components can effectively represent all the eight components. The three components were that the cloud vendors provide access to 24/7 cloud support irrespective of severity of the cases, provide third-party software support, and architectural support for both general cases and specific use-cases. These were further analysed with inferential statistics as shown in Section **4.5.5 Inferential Statistics**.

The rotated component matrix shown in **Table 4.12** below was extracted to ease the interpretation of the analysis. However, variables with factor loading less than 0.4 were suppressed, while those equal to or greater than 0.4 were retained for further analysis.

Table 4.12 Vendor Support Factor Analysis - Rotated Component Matrix

Rotated Component Matrix[a]

	Component		
	1	2	3
Vendors provide access to 24/7 cloud support irrespective of severity of the cases	.459	.136	.211
Vendors provide Third-Party Software Support, that is, interoperability and configuration guidance and troubleshooting	.385	.174	.715
Vendors provide architectural support for both general cases and specific use-cases	.724	.335	.030
Vendors have implemented the recommended security controls such as access and identity management, and monitoring capabilities	.815	-.145	.047
Vendors have implemented the recommended controls for data privacy and confidentiality	-.011	-.047	.850
Vendors provide 24/7 Self-Help Resources such as documentation, whitepapers, how-to-videos for use of the cloud platforms	.464	.510	.070
Vendors provide sufficient information about the available cloud-based services through trainings, online labaratories etc	.169	.808	-.155
Vendors provide 24/7 proactive and self service options such as automation workflows and reviews, Centralized management of all resources, guidance for provisioning of resources according to best practices etc	-.038	.817	.251

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

Source: Primary Data (2023)

The results shown in **Table 4.13** depict the factors with factor loadings equal to or greater than 0.4. These factors were further categorized into certain suggested themes which include the

accessibility to support and security controls, availability of self-help and proactive support and lastly, software interoperability and data privacy.

Table 4.13 Vendor Support Factor Analysis - Themes derived

Component	Factors	Coeefficient	Suggested Themes
1	Vendors provide access to 24/7 cloud support irrespective of severity of the cases.	0.459	Accessibility to support resources and security controls
	Vendors provide architectural support for both general cases and specific use-cases.	0.724	
	Vendors have implemented the recommended security controls such as access and identity management, and monitoring capabilities.	0.815	
	Vendors provide 24/7 Self-Help Resources such as documentation, whitepapers, how-to-videos for use of the cloud platforms.	0.464	
2	Vendors provide 24/7 Self-Help Resources such as documentation, whitepapers, how-to-videos for use of the cloud platforms.	0.51	Availability of self-help and proactive support
	Vendors provide sufficient information about the available cloud-based services through trainings, online labaratories etc.	0.808	
	Vendors provide 24/7 proactive and self service options such as automation workflows and reviews, Centralized management of all resources, guidance for provisioning of resources according to best practices etc.	0.817	
3	Vendors provide Third-Party Software Support, that is, interoperability and configuration guidance and troubleshooting	0.715	Software Interoperability and data privacy
	Vendors have implemented the recommended controls for data privacy and confidentiality	0.85	

Source: Primary Data (2023)

4.5.4 Rate of cloud computing adoption

A structured questionnaire which provisioned for responses of when or how long ago the respondents had adopted cloud computing, that is, Not Considering/Applicable, Less than 1 year, Between 1 and 3 years, Between 3 and 5 years, Between 5 and 7 years and More than 7 years. The following sub-sections summarize the findings obtained and depicted with use of descriptive statistics and factor analysis.

4.5.4.1 Descriptive Statistics on Rate of Cloud Computing

This section includes the representation of the findings on the descriptive statistics on rate of cloud computing (RCC) as the dependent variable of this study. **Figure 4.2** below shows the graph summary of the findings.

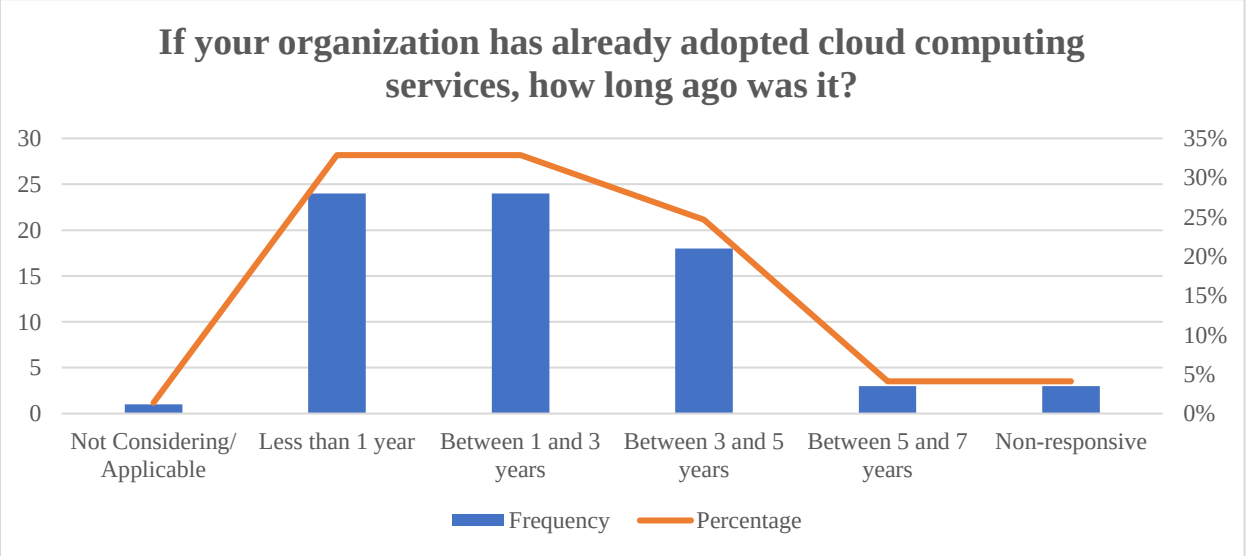


Figure 4.2 Descriptive Statistics on Rate of Cloud Computing - Adoption of Cloud Services

Source: Primary Data (2023)

Based on the results in **Figure 4.2**, majority of the respondents, that is, 33%, indicated that they had adopted cloud computing within their organizations within the period of 0 to 3 years. These were closely followed by those who had adopted the technology between 3 and 5 years at 25%, and the lowest at 4% stated they adopted cloud computing between 5 and 7 years ago. 1% of the respondents mentioned that they were had not considered adoption of the technology. This depicted that cumulatively, 90% of the commercial banks have adopted cloud computing in the last five years. Additionally, as is acceptable by Strathmore University ethics standards that respondents can choose to respond to questions or not, 3% of the respondents were non-responsive.

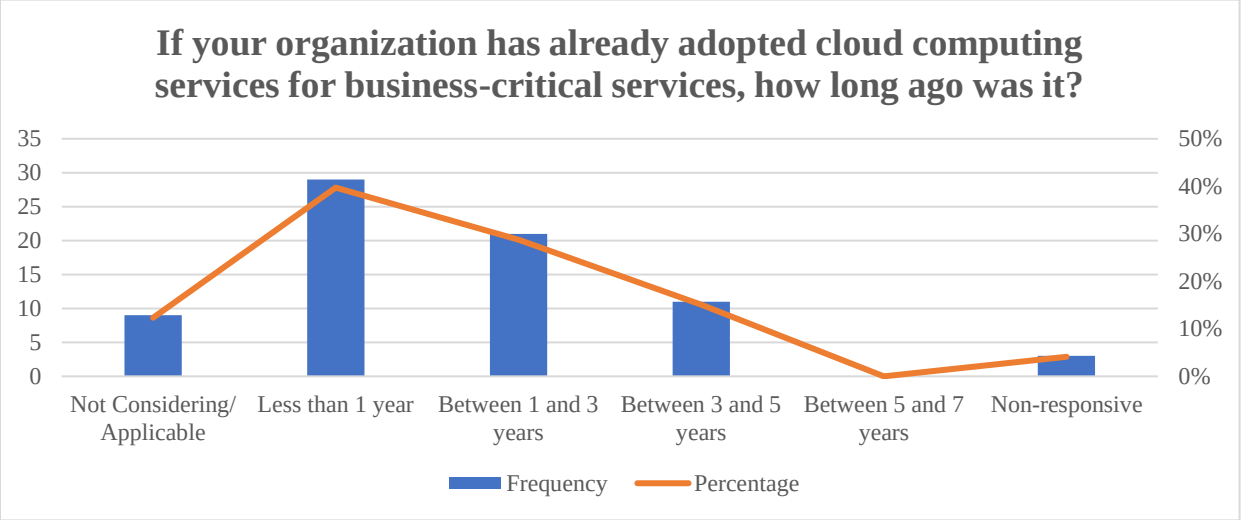


Figure 4.3 Descriptive Statistics on Rate of Cloud Computing - Adoption of Cloud for Business-Critical Services

Source: Primary Data (2023)

Based on the results in **Figure 4.3**, majority of the respondents, that is, 40%, indicated they had adopted cloud computing services for business-critical services less than a year ago. 29% had adopted the technology between 1 and 3 years while 15% between 3 and 5 years. Those respondents who stated they were not considering the adoption of the technology for business-critical services accounted for 12% while it was also found that none of the respondents had adopted the technology between 5 and 7 years ago. This indicated that cumulatively, 84% of commercial banks started the adoption of cloud computing for business-critical services in the period of up to 5 years ago. Additionally, as is acceptable by Strathmore University ethics standards that respondents can choose to respond to questions or not, 4% of the respondents were non-responsive.

Given the findings, it was found that the rate of cloud computing adoption was improving at each period both for the general adoption and for adoption as related to business-critical applications. The rate was calculated by considering the number of new users in each time period divided by the total number of users, and multiplied by 100%. In this case, when the findings were compared to the adopter categories provided by the DOI theory (Rogers, 1983), that is innovators at 2.5%, early adopters at 13.5%, early majority and late majority at 34%, and lastly, the laggards at 16%. It was found that the categories can be aligned to this study if the innovators correspond to those who adopted the technology between 5 and 7 years (3), early adopters to those who adopted between 3 – 5 years (18), early majority to those who adopted between 1 – 3 years (24), late

majority to those who adopted less than 1 year ago (24) and lastly, laggards to those who are not considering the technology .i.e. 3 (or yet to consider). The numbers vary slightly for the adoption of cloud services for business-critical applications but they are generally still aligned with the categories, that is, innovators at 0, early adopters at 11, early majority at 21, late majority at 29 and lastly, laggards at 9. Given the technology is yet to be fully adopted, the numbers associated with laggards may be expected to vary along with the other categories.

According to the latest innovation survey conducted by CBK in 2022, it was stated the rate of adoption of cloud computing was 59% among commercial banks and mortgage finance institution. The adoption was undertaken as one of the initiatives to facilitate innovation activities, strengthen their business models and provide a competitive advantage. Furthermore, 64% of the respondents affirmed their likelihood of undertaking the adoption of cloud computing given it's importance (Central Bank of Kenya, 2022b). These findings highlighted the continued importance of the technology to commercial banks in Kenya. However, details related to the period considered for the adoption or the nature of services consuming cloud computing were not provided.

4.5.4.2 Factor Analysis on Rate of Cloud Computing

Exploratory factor analysis was carried out on this variable to investigate and determine any underlying associations with the other variables and to reduce the number of variables into smaller groups where possible for more in-depth analysis. The Keyser Meyer Olkin (KMO) and the Bartlett's test of Sphericity, were utilized to verify the suitability of the data for factor analysis. These tests were run on the 2 factors within the rate of cloud computing as the dependent variable, and the KMO obtained was 0.500 while the Bartlett's test of Sphericity yielded a value of 0.000 which is less than 0.05. This indicates that factor analysis can be carried out, as the KMO value is above the minimum of 0.5 (Kaiser, 1974) and Bartlett's test of Sphericity less than 0.05. **Table 4.14** below shows the summary of total variance explained.

Table 4.14 Rate of Cloud Computing Factor Analysis - Total Variance Explained

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.450	72.500	72.500	1.450	72.500	72.500
2	.550	27.500	100.000			

Extraction Method: Principal Component Analysis.

Source: Primary Data (2023)

The method of factor extraction utilized was Principal Components Analysis as it utilizes all the variance of the data without making any reference to prior information on the categorizations of the data. Based on the results shown in **Table 4.14**, only the first component that had an Eigenvalue greater than 1 was considered significant and was noted to account for about 72.5% of the variance. Thus implying that this one component, that is, if the commercial banks had already adopted cloud computing services in the period of 0 to 7 years. Further analysis was conducted with inferential statistics as shown in Section **4.5.5 Inferential Statistics**.

The rotated component matrix shown in **Table 4.15** below was extracted to ease the interpretation of the analysis. Further analysis was conducted to determine if any of the variables had factor loading less than 0.4 so as to suppress them, however, all were found to be greater than 0.4 and were retained for additional study.

Table 4.15 Rate of Cloud Computing Factor Analysis - Rotated Component Matrix

Component Matrix[a]

	Component 1
If your organization has already adopted cloud computing services, how long ago was it?	.851
If your organization has already adopted cloud computing services for business-critical services, how long ago was it?	.851

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

Source: Primary Data (2023)

4.5.5 Inferential Statistics

Inferential statistics was used to make inferences about the data collected by showing any relationships between the variables of the study. As such, different statistical tests were conducted, that is, correlation tests to determine the extent to which the business environmental constructs were related to the rate of cloud computing adoption. As well as regression tests (ordinal regression) to determine the relationship between the independent and dependent variables.

4.5.5.1 Correlation Analysis

The correlation analysis was conducted on the specific factors extracted from the factor analysis conducted on all the variables of the study. This analysis was done using Spearman's Rank Correlation (Spearman's rho) to measure the strength and direction of the relationship between the variables in the study which utilized ordinal measurement scales. The coefficient obtained from

this measurement can take on a value between -1 and +1, that is, the negative coefficient indicates a negative relationship where as the values of one variable increase, those of the other decrease and vice versa. While the positive coefficient indicates a positive relationship, that is, as the values of one variable increase, so do those of the other. Where no relationship exists, the coefficient is zero(0) (Cooper & Schindler, 2014). The findings from the correlation analysis are shown in **Table 4.16** below.

Table 4.16 Correlation Analysis

Correlations

			RCC	CP-1	CP-2	CP-3	TPP	VS-1	VS-2	VS-3
Spearman's rho	Rate of Cloud Computing (RCC)	Correlation Coefficient	1.000	.125	.359**	.121	.295	.431**	.048	.069
		Sig. (2-tailed)	.	.302	.002	.319	.013	.000	.690	.570
		N	70	70	70	70	70	70	70	70
	Competitive Pressure 1 (CP-1)	Correlation Coefficient	.125	1.000	.102	.049	.671**	.058	-.031	-.038
		Sig. (2-tailed)	.302	.	.400	.687	.000	.636	.799	.758
		N	70	70	70	70	70	70	70	70
	Competitive Pressure 2 (CP-2)	Correlation Coefficient	.359**	.102	1.000	.007	.301	.382**	.165	-.111
		Sig. (2-tailed)	.002	.400	.	.954	.011	.001	.173	.361
		N	70	70	70	70	70	70	70	70
	Competitive Pressure 3 (CP-3)	Correlation Coefficient	.121	.049	.007	1.000	.190	-.007	.275	.420**
		Sig. (2-tailed)	.319	.687	.954	.	.115	.952	.021	.000
		N	70	70	70	70	70	70	70	70
	Trading Partner	Correlation Coefficient	.295	.671**	.301	.190	1.000	.140	-.055	.192
		Sig. (2-tailed)	.013	.000	.011	.115	.	.246	.652	.111
		N	70	70	70	70	70	70	70	70
	Vendor Support 1 (VS-1)	Correlation Coefficient	.431**	.058	.382**	-.007	.140	1.000	-.022	-.012
		Sig. (2-tailed)	.000	.636	.001	.952	.246	.	.857	.920
		N	70	70	70	70	70	70	70	70
	Vendor Support 2 (VS-2)	Correlation Coefficient	.048	-.031	.165	.275	-.055	-.022	1.000	.056
		Sig. (2-tailed)	.690	.799	.173	.021	.652	.857	.	.644
		N	70	70	70	70	70	70	70	70
	Vendor Support 3 (VS-3)	Correlation Coefficient	.069	-.038	-.111	.420**	.192	-.012	.056	1.000
		Sig. (2-tailed)	.570	.758	.361	.000	.111	.920	.644	.
		N	70	70	70	70	70	70	70	70

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

Source: Primary Data (2023)

The study results in **Table 4.16** shows that there exists a statistically significant but moderate relationship, that is, Spearman's correlation coefficient of 0.359 and $p = 0.002$, between the second factor of competitive pressure and the rate of cloud computing. Additionally, a statistically significant and strong relationship, that is, a Spearman's correlation coefficient of 0.431 and $p = 0.000$, between the first factor of vendor support and the rate of cloud computing. Spearman's correlation coefficients between 0.30 – 0.39 are considered to depict a moderate relationship while those between 0.40 – 0.69 depict a strong relationship between the variables being analysed (Dancey & Reidy, 2004). A significance level of 0.01 was utilized to increase the confidence in the determination of the significance. Thus, the results showed that there existed a moderate positive correlation between the rate of adoption of cloud computing and the competition in the industry driving commercial banks towards the use of cloud-based services. It also showed a strong positive correlation between the rate of cloud computing and the commercial banks requirement for cloud vendors to provide access to 24/7 cloud support irrespective of severity of the cases.

4.5.5.2 Regression Analysis

The study sought to utilize regression analysis to estimate the relationships between the independent variables and dependent variable. In particular, the study considered the factors extracted from the factor analysis for further analysis with ordinal logistic regression and the findings include the model fitting information, goodness-of-fit, pseudo r-square and parameter estimates. The Model fitting information results are shown in **Table 4.17 Regression Analysis - Model Fitting Information** below.

Ordinal logistic regression was considered for this study to determine the relationship between the independent and dependent variables which used ordinal measurement scales. Based on the results in **Table 4.17**, the model was found to be significant at 0.000 ($p < 0.05$) which implied it was an improvement from the null or baseline intercept-only model. Thus, it showed that the model was a good fit.

Table 4.17 Regression Analysis - Model Fitting Information

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	326.004			
Final	211.039	114.965	14	.000

Link function: Logit.

Source: Primary Data (2023)

The Goodness-of-fit results shown in **Table 4.18**, are meant to depict if the observed data are consistent with the fitted model. If the significance value is less than 0.05, then it is considered a poor fit while if it is higher than 0.01, the model is said to adequately fit the data. As observed in **Table 4.18**, the results obtained were mixed, that is, the Deviance was 1.000 which is greater than 0.05, thus insignificant while the Pearson was 0.020 which is less than 0.05 thus significant.

Table 4.18 Regression Analysis - Goodness-of-Fit

Goodness-of-Fit			
	Chi-Square	df	Sig.
Pearson	752.807	675	.020
Deviance	279.308	675	1.000

Link function: Logit.

Source: Primary Data (2023)

The Pseudo R-Square results shown in **Table 4.19** are meant to provide an approximation of the variations in the variables. Based on the output, the McFadden value of R-Square which is often used in ordinal logistic regression is 0.350. The value can range from 0 to 1, with 0 showing that the independent variables do not improve the model fit and a value of 1 indicating that the independent variables perfectly predict the dependent variable. Any values between 0.2 and 0.4 are meant to indicate a good model fit (Louviere et al., 2000). In the case of this study, it was found that this model was a good fit and provided a 35% improvement in assessing the business environmental factors influencing the rate of cloud computing compared to the baseline model.

Additionally, the Nagelkerke R-Square which similarly has values between 0 and 1, with values closer to 1 indicating a better fit of the model. The results obtained as shown in **Table 4.19** for the Nagelkerke R-Square was 0.814 which indicated a strong relationship between the factors extracted and the rate of cloud computing.

Table 4.19 Regression Analysis - Pseudo R-Square

Pseudo R-Square	
Cox and Snell	.806
Nagelkerke	.814
McFadden	.350

Link function: Logit.

Source: Primary Data (2023)

The parameter estimates as shown in **Table 4.20** below depicted how much each of the factors extracted from the factor analysis contributed to the rate of cloud computing as the dependent variable. Factors 1 and 3 associated with competitive pressure reported -0.185 and -0.271 as estimate values which implied that when those factors are seen to increase, the rate of cloud computing is reduced or negatively affected. While factor 2 associated with competitive pressure reported +0.325 which implied that for every unit increase this factor, there was an increase of 0.325 on the rate of cloud computing. However, only factor 3, that is, price competition in the industry drove the commercial banks towards the use of cloud-based services, was found to be statistically significant at 0.04 ($p < 0.05$). Factor 2 though moderately positively correlated to the rate of cloud computing adoption was insignificant which implied that the effect might not have been strong enough for generalization to the entire population.

Additionally, for trading partners' pressure, it was found that for every unit increase, there was a decrease of 0.452 in the rate of cloud computing as depicted by the negative sign obtained. This was also found to be statistically significant at 0.044. Thus, when the commercial bank trading partners offered competitive products hosted only on cloud platforms, it negatively affected the rate of adoption of cloud computing.

Lastly, for vendor support as an influencer of the rate of adoption of cloud computing, all three factors extracted reported positive estimates which indicated that an increase in those factors would also lead to an increase in the rate of cloud computing. However, only factors 1 and 3 were found statistically significant at 0.000 and 0.028 ($p < 0.05$) respectively with estimates of 1.334 and 0.414 respectively. These two factors were that the commercial banks required cloud vendors to provide access to 24/7 cloud support irrespective of severity of the cases and also provide architectural support for both general cases and specific use-cases.

Table 4.20 Regression Analysis – Parameter Estimates

Parameter Estimates

							95% Confidence Interval	
		Estimate	Std. Error	Wald	df	Sig.	Lower Bound	Upper Bound
Threshold	Rate Computing	8.127	2.543	10.214	1	.001	3.143	13.112
	Competitive Pressure 1	-.185	.197	.882	1	.348	-.571	.201
	Competitive Pressure 2	.325	.170	3.679	1	.055	-.007	.658

	Competitive Pressure 3	-.271	.132	4.231	1	.040	-.529	-.013
	Trading partners' pressure	-.452	.224	4.062	1	.044	-.892	-.012
	Vendor Support 1	1.334	.279	22.884	1	.000	.788	1.881
	Vendor Support 2	.234	.167	1.964	1	.161	-.093	.561
	Vendor Support 3	.414	.189	4.805	1	.028	.044	.785

Link function: Logit.

Source: Primary Data (2023)

4.5.6 Chapter Summary

The chapter sought to present the research findings based on the analysis of the data collected. The results showed a response rate of 62% with the respondents from three departments, that is, strategy, IT and operations. It was also reported that 90% had adopted cloud computing in the last 5 years compared to 84% adoption for business-critical services.

The results from the factor analysis on all the variables of the study indicated that certain factors within the same variables accounted for a significant portion of the variance and could represent the others. For competitive pressure the extracted factors were, ease for the commercial bank customers to switch to other banks for similar products/services without much difficulty, competition and more specifically price competition in the industry drove their organizations towards the use of cloud-based services. Only one factor was extracted for trading partners' pressure, that is, the commercial bank trading partners offered competitive products hosted only on cloud platforms, thus pressuring them to adopt cloud computing. Lastly, for vendor support, the commercial banks required that the cloud vendors provide access to 24/7 cloud support irrespective of severity of the cases, provide third-party software support, and architectural support for both general cases and specific use-cases.

The correlation tests found that there existed a moderate positive correlation between the rate of cloud computing and the competition in the industry driving commercial banks towards the use of cloud-based services (the second extracted factor). It also showed a strong positive correlation between the rate of cloud computing and the commercial banks requirement for cloud vendors to provide access to 24/7 cloud support irrespective of severity of the cases. Finally, the results from the ordinal regression found that the third factor extracted for competitive pressure, one factor from trading partners' pressure and the first and third factors from vendor support had a significant association with the rate of cloud computing. Those associated with competitive and trading partners' pressure had negative signs implying an increase in the pressure would have a decrease

in the rate of cloud computing, while those of vendor support had positive signs which showed that an increase would likewise increase the rate of adoption of the technology. These factors were, price competition in the industry drove the commercial banks towards the use of cloud-based services, trading partners offered competitive products hosted only on cloud platforms, the requirement for cloud vendors to provide access to 24/7 cloud support irrespective of severity of the cases and also provide architectural support for both general cases and specific use-cases.

CHAPTER 5 : DISCUSSION OF FINDINGS, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter presented the discussion of the findings, conclusion and recommendations. It also included the limitations of the study and proposed areas for further research.

5.2 Discussion of the Findings Based on the Objectives of this Study

The main purpose of this study was to assess how the business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya. The business environmental factors considered were competitive pressure, vendor support and trading partners' pressure as influencers of the rate of adoption of the technology. The study adopted a descriptive design. The following sections on the discussion of the findings provided a discussion on the general information obtained on cloud computing as well as each of independent and dependent variables.

The target population was 117 and of this, 73 responded which accounted for a response rate of 62%. It was also found that 92% had an IT strategy that included cloud computing as an existing technology to be utilized which signified the importance of a successful adoption within the banks, thus crucial for the organization's success as indicated by another study in France (Khalil, 2019). This finding when combined with the results that showed that 88% of the respondents stated they had a moderate to very high level of preparedness for the adoption of the technology, implied that this improved the levels of incorporation of the technology in their IT strategy. This in turn could have explained the 52% satisfaction level for those who had consumed the technology which aligned with studies (Adane, 2022; Khalil, 2019) that stated that those organizations which were better prepared for cloud adoption would be more likely to achieve their expectations.

The study found that majority of the commercial banks had adopted SaaS (51%), then followed by IaaS at 29% and lastly, PaaS at 11% as cloud computing service models. This is aligned with findings from studies conducted within Kenya on adoption of cloud computing in insurance industries (Mwaurah, 2020) and MFIs (Munya, 2017) which are also within the financial services sector. The significant use of the SaaS service model compared to the others was attributed predominantly to the reduction in administrative tasks for the IT department thus allowing them to focus on their core business.

Lastly, it was found that majority of commercial banks had adopted a hybrid deployment model (40%), followed by private (22%), public (12%) and finally, community cloud at 15%. This finding that showed that commercial banks had opted to host some services within their premises and others externally is contrary to other studies (Mwaurah, 2020; Tiren, 2017; Wambugu, 2018) which highlighted that concerns such as security and privacy as well as internet connectivity and the associated costs, limited the adoption of hybrid deployment models. This implied that inspite any inhibiting factors, the commercial banks had opted for the hybrid deployment model possibly to benefit from the agility in service provisioning it offered.

5.2.1 Competitive Pressure as an influencer of the rate of cloud computing adoption

The study sought to examine how competitive pressure influenced the rate of cloud computing adoption by commercial banks in Kenya. When all the factors were analysed with use of factor analysis, it was found that three of the eight factors associated with competitive pressure could represent all the factors. The three factors were the ease for the commercial bank customers to switch to other banks for similar products/services without much difficulty, competition and more specifically price competition in the industry had driven their organizations towards the use of cloud-based services. However, based on the ordinal regression findings, only factor 3, that is, price competition in the industry drove the commercial banks towards the use of cloud-based services, was found to be statistically significant resulting in a negative relationship with the rate of cloud computing adoption. This implied that increased competitive pressure as related to price led to a decreased rate of cloud computing adoption.

The results contradict those obtained in different studies in India (Gangwar et al., 2015), Saudi Arabia (Alkhater et al., 2014), the UK (Gutierrez et al., 2015) and Kenya (Meshack, 2015; Tiren, 2017) that found that competitive pressure positively influenced the rate of cloud computing adoption. They stated that due to the increasingly competitive markets, organizations were driven to follow industry leaders or other players who may have adopted the technology for example, to drive innovation as an advantage.

The findings were also contrary to other studies (Alshamaila et al., 2013; Khayer et al., 2020; Oliveira et al., 2014) that concluded that competitive pressure had an insignificant influence on the rate of cloud computing adoption. These studies stated that other factors related to technology and the respective organizations prevented the benefits of cloud computing from being translated into a competitive advantage.

This difference in results could have been attributed to the commercial banks opting not to incur additional expenses when being pressured by competitors on pricing of their service offerings. The typical effect of competition on pricing is a reduction in pricing to attract demand but this conversely causes a reduction in profits for the respective organization (Njiffia, 2009). As such, this finding highlighted that the nature of the competitive pressure experienced by an organization could offer in different results, for example, in this case the commercial banks appeared to have sensitivity to price in comparison to other aspects such as innovation, which was found to be an insignificant factor of competitive pressure.

Overall, the study concluded that competitive pressure is a negative influencer of the rate of cloud computing adoption. Specifically, competition on price was the aspect of competitive pressure that was found to depict the negative influence.

5.2.2 Trading Partners' Pressure as an influencer of the rate of cloud computing adoption

The study sought to examine how trading partners' pressure influenced the rate of cloud computing adoption by commercial banks in Kenya. Factor analysis output showed that one component accounted for majority of the variance, that is, the commercial bank trading partners offered competitive products hosted only on cloud platforms, thus pressuring them to adopt cloud computing and influencing the rate of adoption. The inferential statistics found that when the commercial bank trading partners offered competitive products hosted only on cloud platforms, it negatively affected the rate of cloud computing adoption. This implied that when the pressure from the trading partners increased, the rate of cloud computing adoption decreased.

The results contradict other studies (Modisane & Jokonya, 2021; Senyo et al., 2016; Sharma et al., 2021) which found that trading partner pressure positively influenced the rate of cloud computing adoption. The conclusion drawn for this positive influence in a study conducted in Ghana was that trading partners' pressure would force an organization to adopt an innovation so as to maintain working relationship with those partners (Senyo et al., 2016). This same finding and conclusion was drawn in a study conducted on SMEs in Kenya (Wambugu, 2018). Additionally, the findings were also contrary to other studies (Alkhater et al., 2014; Gui et al., 2020) that concluded that trading partners' pressure had an insignificant influence on the rate of cloud computing adoption.

This difference in findings could have been attributed to the commercial banks opting for other available products from the trading partners which may not necessarily be considered competitive. This could also have implied that the banks considered other factors for adoption of their trading partners' products such as functionality. As such, this finding highlighted that inspite the incentives

offered by trading partners to accelerate the rate of adoption, the commercial banks opted not to consume the cloud services which implied that other forms of incentives should be considered by trading partners to improve the rate of adoption. This is further emphasized by the insignificance of the other factors associated with trading partners' pressure such as, changes in customer behavior and demands.

Overall, the study concluded that trading partners' pressure is a negative influencer of the rate of cloud computing adoption. Specifically, when trading partners offered competitive products hosted only on cloud platforms to drive the cloud computing adoption, it was found to result in a decrease in the rate of cloud computing adoption.

5.2.3 Vendor support as an influencer of the rate of cloud computing adoption

The study sought to examine how vendor support influenced the rate of cloud computing adoption by commercial banks in Kenya. Based on the findings from the descriptive statistics, it was found the commercial banks were more likely to adopt cloud computing due to the support offered by cloud vendors. When all the factors were analysed with use of factor analysis, it was found that three of the eight factors associated with vendor support could represent all the factors. The three components were that the cloud vendors provide access to 24/7 cloud support irrespective of severity of the cases, provide third-party software support, and architectural support for both general cases and specific use-cases. A strong positive correlation between the rate of cloud computing and first factor, that is, the commercial banks requirement for cloud vendors to provide access to 24/7 cloud support irrespective of severity of the cases was found. This same first factor, along with the third, that is, cloud vendor provisioning for architectural support, were found to be statistically significant and positively influencing the rate of cloud computing adoption.

These results were aligned with studies conducted in India (Gangwar, 2017), China (Chang et al., 2019), and England (Alshamaila et al., 2013) which also found that vendor support from cloud providers was essential to improving the rate of cloud computing adoption. This was attributed to the expectation that organizations were more likely to obtain the benefits from the adoption of the technology if the vendor support was as required.

However, the findings highlighted which aspects of vendor support had a significant influence on the rate of cloud computing adoption which is an addition to the existing research. This showed that not all aspects of vendor support are of importance to commercial banks in Kenya, for example, those related to security, data privacy and protection, which had been noted to be of significance in other studies (Ali et al., 2020; Jianwen & Wakil, 2020; Khayer et al., 2020; Sharma

et al., 2021; Tiren, 2017), were found insignificant. This could have implied that even while the commercial banks are concern, for example, with the security requirements, they may have already verified that the cloud vendors comply with advanced security standards (Oliveira et al., 2014) and are thus, influenced more by other aspects of the vendor support.

Overall, the study concluded that vendor support is a positive influencer of the rate of cloud computing adoption. Specifically, the requirement for cloud vendors to provide access to 24/7 cloud support irrespective of severity of the cases as well as the provisioning of architectural support.

5.3 Conclusion

The study aimed at assessing how the business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya. The findings on the first objective, competitive pressure as an influencer of the rate of cloud computing adoption, highlighted that a negative relationship exists, that is, an increase in competitive pressure resulted in a decrease in the rate of cloud computing adoption. It was found that the specific factor within competitive pressure that had this effect was related to competition on pricing while the other factors related to aspects such as innovation and competitive advantage, were found to be insignificant. This is an addition to existing research especially within the financial services sector as it highlighted that different aspects of competitive pressure can have different effects to the rate of cloud computing adoption. Additionally, it implied that in order to improve the adoption rates of the technology, workarounds would need to be adopted to address the sensitivity to price for commercial bank products and services. Such workarounds could be to first identify the cause of the sensitivity and consider differentiation strategies among other possible solutions.

For the second objective, trading partners' pressure as an influencer of the rate of cloud computing adoption, it was found that for an increase in the independent variable, there is a decrease in the dependent variable. The nature of the relationship was specifically found when competitive products were offered only on cloud computing platforms by trading partners which is also an addition to existing research. This finding, along with the insignificance of changes in customer bahavior and demands, suggested that perphaps other forms of incentives should be considered by trading partners to improve the rate of adoption.

With regard to the third objective, vendor support as an influencer of the rate of cloud computing adoption, it was found that indeed there existed a positive association between the variables, that is, an increase in vendor support resulted in an increase in the rate of adoption. As with the other

objectives, the study found that certain specific aspects of vendor support were significant, that is, the cloud vendors to provisioning of access to 24/7 cloud support irrespective of severity of the cases was found and provision of architectural support. This highlighted that the commercial banks value accessibility to support services whose aim is to ensure improved service uptime for their customers. Aspects related to security and data privacy which were previously considered critical and even inhibitors to the adoption of the technology, especially in the financial services sector were found insignificant which implied that other factors are more of a priority for commercial banks.

Finally, it can be concluded that all three business environmental factors considered during this study were found to be influencers of the rate of cloud computing adoption in commercial banks in Kenya where the adoption rate was found to have been increasing over the last 7 years. This adoption rate was observed to be 33% and 40% in the last 1 year for general adoption of cloud services and business-critical applications respectively.

5.4 Recommendations

The study concluded that business environmental factors do influence the rate of cloud computing both positively and negatively. With regard to cloud vendors, the study found that aspects to do with accessibility to different kinds of support services were of significance to commercial banks. Thus, cloud vendors such as, cloud service providers should seek to ensure that their offerings include these aspects of support services and work to build awareness about the services to the commercial banks. The vendors should also consider approaching each of the commercial banks to determine and address any requirements associated with architectural support, as each bank would have a unique technology architecture in place. This could possibly assist the commercial banks gain a better understanding of how their technology environments when integrated with cloud environments can seamlessly operate, which could increase the rate of cloud computing adoption.

The commercial bank trading partners' should consider other incentives or approaches of getting the commercial banks to consider adopting cloud computing. For example, consideration of adoption of the technology in areas where their could be mutual gain for both parties which would ensure that any concerns or limitations are addressed.

For the commercial banks, consideration should be given to what other areas the adoption of cloud computing would assist them achieve their business objectives if not already done. This would ensure that any adoption is tailored to their specific use-cases so as to achieve better outcomes.

The policy makers should continue to work with the commercial banks to ensure the necessary enforcements are enacted given the sensitivity of the sector. This would also ensure that the necessary support (where applicable) is provided to the commercial banks improve their service delivery, and thus improve the adoption rate of the technology.

5.5 Limitations of the Study

The researcher encountered challenges as a result of the political unrest from the demonstrations that were ongoing at the time of data collection and as such, the period of collection was extended from two to four weeks. Additionally, some of the banks were unwilling to participate in the study due to the sensivity to privacy while for others, the participants were out of the office or unavailable for extended periods of time. These were mitigated by waiting for the restoration of peace as the demonstrations were limited to specific days and the provision of electronic data collection.

5.6 Recommendations for Areas of Further Research

The study focused on assessing how the business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya. Future studies could consider if aspects such as the tiering level of the bank, ownership structure, organizational culture etc. would influence the adoption rates. They should also consider other factors such as technological and organizational, that could also influence the rate of adoption of the technology.

Additionally, future studies could consider investigating the impact of the adoption of cloud computing on aspects such as organizational performance and strategy. This could be conducted within commercial banks and others in financial services sector as well as others sectors.

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APPENDICES

Appendix I: Ethical Approval Letter

Strathmore UNIVERSITY

5th April 2023

Ms Kemigisha Audrine Innocent,
audrine.kemigisha@strathmore.edu

Dear Ms Kemigisha,

RE: Influence of Business Environmental Factors on the Rate of Cloud Computing Adoption by Commercial Banks: Case Kenya

This is to inform you that SU-ISERC has reviewed and **approved** your above **SU-masters** research proposal. Your application reference number is **SU-ISERC1664/23.** The approval period is from **5th April 2023 to 4th April 2024.**

This approval is subject to compliance with the following requirements:

i. Only approved documents including (informed consents, study instruments, MTA) will be used
ii. All changes including (amendments, deviations, and violations) are submitted for review and approval by SU-ISERC.
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to SU-ISERC within 48 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affected safety or welfare of study participants and others or affect the integrity of the research must be reported to SU-ISERC within 48 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions.
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal.
vii. Submission of an executive summary report within 90 days upon completion of the study to SU-ISERC.

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology, and Innovation (NACOSTI) https://research-portal.nacosti.go.ke/ and obtain other clearances needed.

Yours sincerely,

for: **Dr Ben Ngoye,**
Secretary; SU-ISERC

STRATHMORE UNIVERSITY INSTITUTIONAL SCIENTIFIC AND ETHICAL REVIEW COMMITTEE
(SU-ISERC)
05-Apr-2023
Email:ethicsreview@strathmore.edu
P.O BOX 59857-00200
NAIROBI-KENYA

Cc: Mr Ambrose Rachier,
Chairperson; SU-ISERC

Ole Sangale Rd, Madaraka Estate. PO Box 59857-00200, Nairobi, Kenya. Tel +254 (0)703 034000
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Appendix II: National Commission for Science, Technology and Innovation (NACOSTI) Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **598382**

Date of Issue: **14/April/2023**

RESEARCH LICENSE

This is to Certify that Miss.. Audrine Innocent Kemigisha of Strathmore University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: Influence of Business Environmental Factors On The Rate Of Cloud Computing Adoption By Commercial Banks: Case Kenya for the period ending : 14/April/2024.

License No: **NACOSTI/P/23/25178**

598382

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013 (Rev. 2014)
Legal Notice No. 108: The Science, Technology and Innovation (Research Licensing) Regulations, 2014

The National Commission for Science, Technology and Innovation, hereafter referred to as the Commission, was the established under the Science, Technology and Innovation Act 2013 (Revised 2014) herein after referred to as the Act. The objective of the Commission shall be to regulate and assure quality in the science, technology and innovation sector and advise the Government in matters related thereto.

CONDITIONS OF THE RESEARCH LICENSE

1. The License is granted subject to provisions of the Constitution of Kenya, the Science, Technology and Innovation Act, and other relevant laws, policies and regulations. Accordingly, the licensee shall adhere to such procedures, standards, code of ethics and guidelines as may be prescribed by regulations made under the Act, or prescribed by provisions of International treaties of which Kenya is a signatory to
2. The research and its related activities as well as outcomes shall be beneficial to the country and shall not in any way;
    i. Endanger national security
    ii. Adversely affect the lives of Kenyans
    iii. Be in contravention of Kenya's international obligations including Biological Weapons Convention (BWC), Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO), Chemical, Biological, Radiological and Nuclear (CBRN).
    iv. Result in exploitation of intellectual property rights of communities in Kenya
    v. Adversely affect the environment
    vi. Adversely affect the rights of communities
    vii. Endanger public safety and national cohesion
    viii. Plagiarize someone else's work
3. The License is valid for the proposed research, location and specified period.
4. The license any rights thereunder are non-transferable
5. The Commission reserves the right to cancel the research at any time during the research period if in the opinion of the Commission the research is not implemented in conformity with the provisions of the Act or any other written law.
6. The Licensee shall inform the relevant County Director of Education, County Commissioner and County Governor before commencement of the research.
7. Excavation, filming, movement, and collection of specimens are subject to further necessary clearance from relevant Government Agencies.
8. The License does not give authority to transfer research materials.
9. The Commission may monitor and evaluate the licensed research project for the purpose of assessing and evaluating compliance with the conditions of the License.
10. The Licensee shall submit one hard copy, and upload a soft copy of their final report (thesis) onto a platform designated by the Commission within one year of completion of the research.
11. The Commission reserves the right to modify the conditions of the License including cancellation without prior notice.
12. Research, findings and information regarding research systems shall be stored or disseminated, utilized or applied in such a manner as may be prescribed by the Commission from time to time.
13. The Licensee shall disclose to the Commission, the relevant Institutional Scientific and Ethical Review Committee, and the relevant national agencies any inventions and discoveries that are of National strategic importance.
14. The Commission shall have powers to acquire from any person the right in, or to, any scientific innovation, invention or patent of strategic importance to the country.
15. Relevant Institutional Scientific and Ethical Review Committee shall monitor and evaluate the research periodically, and make a report of its findings to the Commission for necessary action.

National Commission for Science, Technology and
Innovation(NACOSTI),
Off Waiyaki Way, Upper Kabete,
P. O. Box 30623 - 00100 Nairobi, KENYA
Telephone: 020 4007000, 0713788787, 0735404245
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Website: www.nacosti.go.ke

Appendix III: Strathmore University Business School Introductory Letter

Ole Sangale Rd, Madaraka Estate
P. O Box 59857 - 00200, Nairobi, Kenya.
Cell: +254 703 034 414/6/7, Twitter: @SBSKenya
Facebook/Linkedin: Strathmore Business School

Email: **info@sbs.ac.ke** or visit **www.sbs.strathmore.edu**

Strathmore UNIVERSITY BUSINESS SCHOOL

Tuesday, April 11, 2023

To whom it may concern.

RE: FACILITATION OF RESEARCH – AUDRINE INNOCENT KEMIGISHA

This is to introduce Audrine Innocent Kemigisha, who is an MBA student at Strathmore University Business School, admission number MBA/133925/20. As part of our MBA Program, Audrine is expected to do applied research and to undertake a project. This is in partial fulfillment of the requirements of the MBA course. To this effect, she would like to request the appropriate data from your organization.

Audrine is undertaking a research paper on " ***Influence of Business Environmental Factors on The Rate of Cloud Computing Adoption by Commercial Banks: Case Kenya***"." The information obtained from your organization shall be treated confidentially and be used for academic purposes only.

Our MBA seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct use to industry. We would be glad to share the findings with you after the research, and we trust that you will find them of great interest and of practical value to your organization.

We appreciate your support, and we shall be willing to provide any further information if required.

Yours sincerely,

Alois Njenga,
Graduate Programs – Manager.
Strathmore University Business School.

Strathmore University Business School is a Proud member of:

Association of African Business Schools AABS EFMD AACSB

Appendix IV: Questionnaire

This questionnaire aims at collecting information on how business environmental factors influence the rate of cloud computing adoption by commercial banks in Kenya. Please answer the following questions as indicated in the respective section instructions.

Participation in this study is voluntary and the respondent may discontinue participation at anytime without penalty or may skip any question they do not feel comfortable answering. Non-participation will result in no penalty or loss of benefits to the respondent. Information collected will be treated with due confidentiality and will be used for academic purposes only.

Section A: Demographic Information

1. Gender: Male ( ) Female ( )
2. Age (Please tick which bracket you fall in):

   Below 24 years ( ) 41 – 45 years ( )

   24 – 30 years ( ) 46 – 50 years ( )

   31 – 35 years ( ) Above 50 years ( )

   36 – 40 years ( )

3. What is your current position at your organization? (Tick one):

   Chief Information Officer ( )

   Head of IT/ICT ( )

   Head of Systems/Infrastructure ( )

   Head of Cloud and Innovation ( )

   Head of Strategy ( )

   Chief Operations Officer ( )

   Others (Please specify) _____

4. How would you classify your role in the adoption of cloud computing for your organization?

   Responsible ( )

   Accountable ( )

   Consulted ( )

   Informed ( )

5. How long have you worked in the organization? (Tick one)

   Less than 1 year ( )

   1 to 3 years ( )

   4 to 5 years ( )

   6 to 7 years ( )

   More than 7 years ( )

Section B: General Information on Cloud Computing Adoption

6. Does your organization have an IT strategy?

   Yes ( ) No ( )

7. Does your IT strategy or plans include cloud computing as an existing technology to utilize?

   Yes ( ) No ( )

8. Does your IT strategy or plans include cloud computing as a technology to utilize in the future?

   Yes ( ) No ( )

9. Have you implemented and adopted cloud computing in your organization?

   Yes ( ) No ( )

   If No, please skip to question 17 below.

10. What was your initial level of preparedness for the adoption of cloud computing?

    Very Low ( ) Low ( ) Moderate ( ) High ( ) Very high ( )

11. In which department has cloud computing been implemented?

    IT ( )

    Risk ( )

Finance ( )

Procurement ( )

Operations ( )

Business Development ( )

Strategy ( )

Legal ( )

Marketing ( )

Human Resource ( )

Others (Please specify) _____

12. What service model(s) is currently implemented in your organization?

IaaS ( )
SaaS ( )
PaaS ( )
Not Applicable ( )

13. What deployment model(s) is currently implemented in your organization?

Public Cloud ( )
Private Cloud ( )
Community Cloud ( )
Hybrid Cloud ( )
Not Applicable ( )

14. Kindly rate your level of satisfaction with the cloud computing services being consumed.

Very dissatisfied ( ) Dissatisfied ( ) Neutral ( ) Satisfied ( ) Very satisfied ( )

15. To what extent did the following factors influence your decision to adopt of cloud computing?

1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

	Tick				
	1	2	3	4	5
Flexible Cost Structures	( )	( )	( )	( )	( )
Ability to scale on demand	( )	( )	( )	( )	( )

Potential reduced operational costs	( )	( )	( )	( )	( )
Improved service availability and quality	( )	( )	( )	( )	( )

16. How would you rate the following for being the reasons for not adopting cloud computing in your organization?

    1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

	Tick					
	1	2	3	4	5	
Lack of finances	( )	( )	( )	( )	( )	
Lack of knowledge on cloud computing	( )	( )	( )	( )	( )	
Lack of management and leadership support	( )	( )	( )	( )	( )	
Lack of in-house skills		( )	( )	( )	( )	( )
Incompatibility with existing IT landscape	( )	( )	( )	( )	( )	
No perceived tangible benefits	( )	( )	( )	( )	( )	
Vendor lock-in	( )	( )	( )	( )	( )	
Regulatory Compliance	( )	( )	( )	( )	( )	
Business Continuity	( )	( )	( )	( )	( )	

Section C: Competitive Pressure as an influencer of the rate of cloud computing adoption

17. To what extent would the following influence your decision to adopt cloud computing in your organization?

    1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
It's easy for our customers to switch to another bank for similar products/services without much difficulty.					
Competition in our industry has driven our organization towards the use of cloud-based services.					

Price Competition in our industry has driven our organization towards the use of cloud-based services.					
Market Share Competition for (certain) products/services in our industry has driven our organization towards the use of cloud-based services.					
We intend to leverage cloud computing as a technology for innovation (or other use-cases) to increase our market share for (certain) products/services					
We intend to leverage cloud computing as a technology for innovation (or other use-cases) to create new products/services					
We understand the competitive advantages offered by cloud computing in our industry.					
Cloud would increase our ability to outperform the competition thus gain competitive advantage.					

Section D: Trading Partners' Pressure as an influencer of the rate of cloud computing adoption

18. To what extent did the following factors influence your decision to adopt cloud computing?

1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Our trading partners offer competitive products hosted only on cloud platforms, thus we are being pressured to adopt cloud computing.					
Changes in customer behavior and demands are pressuring us to adopt cloud computing.					
Changes in other trading partners' requirements and demands are pressuring us to adopt cloud computing. Examples of such trading partners include mobile network operators, utility companies, professional or international affiliates like SWIFT (Society for Worldwide Interbank Financial Telecommunication) etc.					
We adopted cloud computing because some of the products or services offered by our trading partners are only offered on the cloud					

Section E: Vendor Support as an influencer of the rate of cloud computing adoption

19. To what extent do the below factors influence your organizational cloud adoption?

1 = Strongly disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree

	Strongly Disagree	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
Vendors provide access to 24/7 cloud support irrespective of severity of the cases					
Vendors provide Third-Party Software Support, that is, interoperability and configuration guidance and troubleshooting.					
Vendors provide architectural support for both general cases and specific use-cases.					
Vendors have implemented the recommended security controls such as access and identity management, and monitoring capabilities.					
Vendors have implemented the recommended controls for data privacy and confidentiality.					
Vendors provide 24/7 Self-Help Resources such as documentation, whitepapers, how-to-videos for use of the cloud platforms.					
Vendors provide sufficient information about the available cloud-based services through trainings, online labaratories etc.					
Vendors provide 24/7 proactive and self service options such as automation workflows and reviews, Centralized management of all resources, guidance for provisioning of resources according to best practices etc.					

Section F: Rate of cloud computing adoption

20. How would you classify the rate of adoption of cloud computing in your organization?

	Not Considering/ Applicable	Less than 1 year	Between 1 and 3 years	Between 3 and 5 years	Between 5 and 7 years	More than 7 years
If your organization has already adopted cloud computing services, how long ago was it?						
If your organization has already adopted cloud computing services for business-critical services, how long ago was it?						

Appendix V: List Of Commercial Banks In Kenya

Item Number	Name of Commercial Bank
1	KCB Bank Kenya Ltd
2	Equity Bank Kenya Ltd
3	Co-operative Bank of Kenya Ltd
4	NCBA Bank Kenya PLC
5	Absa Bank Kenya Plc
6	Standard Chartered Bank (K) Ltd
7	Diamond Trust Bank Kenya Limited
8	Stanbic Bank Kenya Ltd
9	I &M Bank Limited
10	Bank of Baroda (K) Limited
11	Prime Bank Ltd
12	Citibank N.A. Kenya
13	National Bank of Kenya Ltd
14	Family Bank Ltd.
15	Bank of India
16	Ecobank Kenya Ltd
17	SBM Bank Kenya Ltd
18	HFC Ltd
19	Victoria Commercial Bank Plc
20	Habib Bank A.G Zurich
21	Guaranty Trust Bank Limited
22	Gulf African Bank Limited
23	Bank of Africa Ltd
24	Sidian Bank Ltd
25	Credit Bank Plc
26	First Community Bank Ltd
27	Guardian Bank Limited
28	African Banking Corporation Ltd
29	Development Bank of Kenya Ltd
30	Mayfair CIB Bank Limited
31	Middle East Bank (K) Ltd
32	Kingdom Bank Limited
33	DIB Bank Kenya Ltd
34	Consolidated Bank of Kenya Limited
35	Paramount Bank Ltd
36	UBA Kenya Bank Ltd
37	M-Oriental Bank Ltd
38	Access Bank (Kenya) PLC
39	Spire Bank Limited

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Appendix VI: Research Gap Matrix

Author	Focus and Methodology	Findings	Gaps	Addressing the gaps
Nouf Alkhater Gary Wills Robert Walters	**Focus:** Factors Influencing an Organisation's Intention to Adopt Cloud Computing in Saudi Arabia **Methodology:** Qualitative	The significant influencing factors were relative advantage, compatibility, competitive pressure while trading partner pressure is not significant. Industries considered in the study were manufacturing, engineering and energy.	The study used qualitative research and considered different industries thus methodological and contextual gaps.	This study will use quantitative research and carried out on the banking sub-sector, that is, specifically commercial banks.
Hemlata Gangwar Hema Date R. Ramaswamy	**Focus:** Understanding determinants of cloud computing adoption using an integrated TAM-TOE model **Methodology:** Quantitative	The study identified competitive pressure and trading partner pressure as factors that were directly affecting cloud computing adoption rates. Industries in India considered in the study included manufacturing, finance, information and communication technology.	The study considered different industries in India thus a contextual gap. It considered only competitive and trading partners' pressure as business environmental factors thus a contextual gap.	This study will be carried out on the banking sub-sector, that is, specifically commercial banks in Kenya. This study will consider an additional business environmental factor, that is, vendor support.
Yu-Wei Chang Ping-Yu Hsu Shih-Hsiang Huang Jiahe Chen	**Focus:** Determinants of switching intention to cloud computing in large enterprises. **Methodology:** Quantitative	It was found that the factors significant for those switching benefits related to private cloud adoption included the technological context (compatibility), organizational context (financial support) and environmental context (vendor support and industry pressure)	The study considered switching benefits related to private cloud adoption as a mediating variable between the business environmental factors and the intention to switch to cloud computing. Its scope was also limited to one cloud deployment model, that is, private cloud.	This study will consider the direct influence of business environmental factors as independent variables on the rate of cloud computing adoption as the dependent variable. This study will cover all the deployment models, that is, private, public, community and hybrid clouds.

Author	Focus and Methodology	Findings	Gaps	Addressing the gaps
			It was conducted in China on various sectors, that is, 22.9% manufacturing, 21.1% software and IT services, 14.5% wholesale trade and retailing, thus a contextual gap.	This study will be conducted on commercial banks in Kenya.
Can Sayginer Tuncay Ercan	**Focus:** Understanding Determinants Of Cloud Computing Adoption Using An Integrated Diffusion Of Innovation (DOI)-Technological, Organizational And Environmental (TOE) Model. **Methodology:** Quantitative	The significant influencers were found to be technological factors such as relative advantage and organizational factors such as top management support. The insignificant influencers were business environmental factors such as, competitive pressure, regulatory support.	This study was conducted on various sectors, that is, production sector (24.4%) and in the service sector (75.6%). It also considered mediating variables such as privacy and cost savings - thus a contextual gap. The insignificance of the business environmental factors such as competitive pressure is contradictory to other studies (above) thus a disagreement gap.	This study will be conducted on commercial banks in Kenya. This study will also seek to further assess the direct influence of business environmental factors as independent variables on the rate of cloud computing adoption as the dependent variable.
Omar Ali Anup Shrestha Valmira Osmanaj Shahnawaz Muhammed	**Focus:** Cloud computing technology adoption: an evaluation of key factors in local governments **Methodology:** Quantitative	It found that the business environmental factors considered, that is, government regulations and information intensity had no significant influence on adoption rates. Other factors like compatibility, complexity, cost, organizational size and expected benefits significantly influenced adoption. Recommended that further research investigates other business environmental factors in other non-governmental organizations.	The study considered other business environmental factors, that is, government regulations and information intensity thus a contextual gap. It was conducted in Australia on local government entities thus a contextual gap.	As recommended, this study will consider other business environmental factors, that is, vendor support, competitive and trading partners' pressure. This study will be conducted in Kenya and in commercial banks.

Author	Focus and Methodology	Findings	Gaps	Addressing the gaps
Anabel Gutierrez, Elias Boukrami and Ranald Lumsden	**Focus:** Technological, organisational and environmental factors influencing managers' decision to adopt cloud computing in the UK. **Methodology:** Quantitative	The most significant influencing factors were found to be the business environmental factors, that is, competitive pressure and trading partner pressure. Others of significance were complexity and technology readiness. Various industries were considered - Public sector (incl. local and central government, etc.), Charity/not for profit, financial services, Professional/Business services. Recommended that further research is conducted on the business environmental factors while considering specific industry sectors.	The study considered different industries in the UK thus a contextual gap. It considered only competitive and trading partners' pressure as business environmental factors thus a contextual gap.	This study will be carried out on the banking sub-sector, that is, specifically commercial banks in Kenya. As recommended, this study will consider an additional business environmental factor, that is, vendor support.
Seham S. Almubarak	**Focus:** Factors Influencing the Adoption of Cloud Computing by Saudi University Hospitals **Methodology:** Qualitative	The most significant influencing factors were relative advantage, Decision-maker's innovativeness, and knowledge in IT, among others. Those with no significance were business environmental factors such as competitive pressure.	The insignificance of business environmental factors such as pressure from competition is contradictory to other studies (above) thus a disagreement gap. The study utilized qualitative research and was conducted on hospitals thus a methodological gap.	Business environmental factors, that is, competitive pressure, vendor support and trading partners' pressure, will be further considered in this study. This study will use quantitative research and will be conducted among commercial banks.
Cheng Jianwen Karzan Wakil	**Focus:** A model for evaluating the vital factors affecting cloud computing adoption Analysis of the services sector.	Cloud computing adoption is affected by four variables, one of which is the environmental factor with sub-indicators as regulatory environment,	The study was conducted in one hospital in Iran thus a contextual gap.	This study will include over 30 commercial banks in Kenya.

Author	Focus and Methodology	Findings	Gaps	Addressing the gaps
	Methodology: Quantitative	competitive and trading partner pressure.		
Abul Khayer Nusrat Jahan Md. Nahin Hossain and Md. Yahin Hossain	**Focus:** The adoption of cloud computing in small and medium enterprises: a developing country perspective. Furthermore, to measure the effect of cloud computing adoption on cloud-supported firm performance through enhancing organisational agility. **Methodology:** Quantitative	Business environmental factors such as competitive pressure was found to have an insignificant impact on cloud adoption rates.	The study was conducted on SMEs and considered additional scope of cloud-supported firm performance through enhancing organisational agility thus a contextual gap. The insignificance of business environmental factors such as pressure from competition is contradictory to other studies (above) thus a disagreement gap.	This study will be conducted on commercial banks with a scope limited to assessing how the business environmental factors influence the rate of cloud computing adoption by commercial banks. The influence of business environmental factors on the rate of cloud computing adoption will be further assessed in this study.
Kevin Tiren	**Focus:** Cloud Computing Adoption By Small and Medium-sized enterprises in Nairobi County. **Methodology:** Quantitative	Factors influencing adoption include Flexible Cost Structure, Lower Cost of Ownership, Ease of Deployment, Ability to Scale, Reduced Power Consumption.	The study considered the business environmental factors as intervening variables thus a contextual gap. The study was conducted on SMEs from various industries - finance & investment respondents - 6%, retail & consumer goods (25%), Agribusiness (14%), construction & real estate (10%) thus a contextual gap.	This study will consider the business environmental factors as independent variables. This study will be conducted on commercial banks only.
Amos Wachanga Wambugu	**Focus:** Adoption of Cloud-Based Services by SMEs In Developing Countries: Development Of A T-O-E Based Model. **Methodology:** Quantitative	Low adoption of cloud computing especially for business related applications by SMEs. Factors that significantly influenced rate of cloud computing adoption were technological (relative advantage, accessibility), organizational (size and	The study was conducted on SMEs from various industries of which 47% were from IT and 11% from finance. Furthermore, it considered other business environmental, that is, regulations, vendor readiness thus both contextual gap.	This study will be conducted on only commercial banks and consider other factors, that is, competitive pressure and vendor support.

Author	Focus and Methodology	Findings	Gaps	Addressing the gaps
		readiness) and lastly, environmental (trading partner pressure, regulations, vendor readiness).		

Source: Empirical Review Literature

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