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Effect of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya.

Owino, Peter Oyamo
Strathmore Business School
Strathmore University

EFFECT OF DIGITAL PAYMENTS INTEROPERABILITY ON REVENUE COLLECTION FOR SUPERMARKETS IN NAIROBI, KENYA

PETER OYAMO OWINO

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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.

Name of Candidate: **PETER OYAMO OWINO**

Approval:

The dissertation of PETER OYAMO OWINO was approved by the following:

Name of Supervisor: Prof. Jonathan Annan

School/Institute/Faculty: Strathmore Business School

Dr. Ceaser Mwangi

Executive Dean

Strathmore University Business School.

Dr. Bernard Shibwabo

Director, Office of Graduate Studies

DEDICATION

I dedicate this study to my employer (Immediate Manager) who has always encouraged me to keep going, to discover more and unlock the potential in me. His words of wisdom have been a major contributor to my success and achievements, thus far.

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Subject matter refers, with a lot of humility and appreciation, I would like to thank the faculty for supporting me through this course. Special mention to Dr. Hellen Otieno who has supported me, especially in my area of specialization and seminar, equally my Supervisor Professor Jonathan Annan for his continuous support, guidance and consultations through various courses preparing me for this study.

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This study and subsequent projects are to discover and further develop the benefit of Digital currency and interoperability of the same. In line with my employer's Mantra of Transforming lives, it is my sincere hope and prayer that my audience (the merchants, policymakers, Regulator, FINTECH community, E-Commerce Platforms, businesses, and Academic Community) will find my insights useful and of value in further improving the digital world/space we currently live in.

ABSTRACT

Innovation supported by technology is a key driver for business performance in the wake of tough economic situation businesses are facing post covid and further escalated by the war in Ukraine. Businesses are recording declining revenues and hence the need to reorganize their operations to be fit for the future. The objective of the study was to determine the effect of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya. The specific objectives were to determine the effect of acceptability, speed of transactions, traceability and the moderating effect of security on digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya. The study used Technology Acceptance theory and Transactions Cost theory. The positivism research philosophy was adopted for the study. The study focused on major supermarkets in Nairobi and data was collected from the management staff of these organizations to examine adoption of digital payment interoperability within the supermarkets. A descriptive correlational research design was employed in the study. The study targeted 468 employees from accounting, finance, information communication technology (ICT), operations and procurement departments from 18 supermarkets registered with RETRAK in Nairobi County. Purposive sampling was used, where all the ninety heads of departments from the supermarkets were selected as respondents. The researcher employed primary data which was collected through structured questionnaires that were closed ended. The researcher conducted a pilot study where 10 employees from the supermarkets were used to check reliability and validity of instruments. The study found that acceptability, speed of transactions and traceability of digital payments interoperability had a significant positive effect on revenue collection for supermarkets in Nairobi, Kenya. In addition, security has a significant moderating effect on digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya. The study recommends that policymakers should ensure that digital payment systems are secure and protect customer data. Governments can encourage innovation in digital payment systems by providing funding for research and development, as well as offering tax incentives to businesses that develop innovative digital payment solutions. The firms can encourage the development of interoperable digital payment systems that can work across different platforms and devices. To further encourage adoption of digital payments the supermarkets can provide incentives to customers. The supermarkets can also work to educate consumers about the benefits and risks of using digital payment systems.

Key Words: *Acceptability, digital payments interoperability, revenue, security, speed of Transactions, traceability.*

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LIST OF ABBREVIATIONS AND ACRONYMS

ATM: Automated Teller Machine

CBDCs: Central Bank Digital Currencies

EFT: Electronic Funds Transfer

E-payment: Electronic Payment

GePG: Government Electronic Payment Gateway

ICT: Information Communication Technology

KCCA: Kampala Capital City Authority

LGRMS: Local Government Revenue Mobilization System

P2P: Person to Person

POS: Point of Sale

QR Code: Quick Response Code

VAT: Value Added Tax

DEFINITION OF KEY WORDS

Acceptability: This is the quality of digital payments being satisfactory and able to be agreed to or approved of by the customers (Saini, 2017).

Digital Payment: This is a method of payment in which electronic media such as short messages (SMS), internet banking, digital wallet and mobile banking are used (Adm, 2018).

Digital Payments Interoperability: This is where various digital payment platforms are allowed to interact with one another and thus customers can be able to make payments from different bank using one device or from the mobile money account of one provider to the mobile money account of another provider (Franciska & Sahayaselvi, 2017).

Interoperability: Interoperability is the ability of two or more software components to cooperate despite differences in language, interface, and execution platform (Wegner, P.,1996).

Revenue: This is the value of all sales of goods and services recognized by a company in a period. Revenue forms the beginning of a company's income statement and is often considered the "Top Line" of a business (Ghosh, Gu & Jain, 2005).

Security: Payment security refers to providing rules, regulations, and security measures to protect a customer or partner's privacy, data, and transactions (Kadhiwal & Zulfiquar, 2017).

Speed of Transactions: This is the amount of time a digital platform takes to perform a transaction. The more the transaction speed is, the better the customer satisfaction and provides more system availability and faster process (Hassani, Huang & Silva, 2018).

Traceability: This is the ability to access and track any or all information about transactions in digital payments by using a system of recorded identifications (Bevilacqua, Ciarapica & Giacchetta, 2009).

CHAPTER ONE

INTRODUCTION TO THE STUDY

1.0 Introduction

The world is quickly turning into a huge digital space with words such as virtual meetings, digital currency, e-commerce, becoming more and more common in our day-to-day talk. This study is aimed at checking the effects of digital payment interoperability on revenue collection for supermarket in Nairobi, Kenya. To enable interoperability, there is the need to have the necessary infrastructure and compatibility of the same to facilitate inclusivity of all players in the market. The concept of digital payment interoperability therefore ensures that merchants who use digital methods to collect their revenue can do so from any network or platform regardless of the service provider with an aim of enhancing their revenue growth. The chapter focuses on background of the study, statement of the problem, objectives of the study, research questions, scope of the study, significance of the study and limitations of the study.

1.1 Background of the Study

Over the last decade, digital payment interoperability around the world has improved efficiency and flexibility in public and private sector revenue collection. Various researchers have argued that digital payments interoperability has enhanced quality and performance of services and increased operational productivity, reduced costs, and increased efficiency (Gil-Garcia, Pardo & Burke, 2015). Businesses and government organizations are moving into a new phase of consumer interaction where emerging revolutions are performing a major role because of significant technological advancements and a constantly changing regulatory regime. Modern company approaches have been altered by digital technologies from the traditional business model approach (Milkau & Bott, 2015). In Kenya, The Kenya Quick Response Code Standard 2023 by Central Bank, will lay out technical specifications and requirements for CBK-regulated banks and payment service providers issuing QR codes to enable interoperability. The QR codes will enable customers make digital payments in an easy, fast, convenient, and secure manner (Central Bank of Kenya, 2023).

Pandemics such as Covid 19 pandemic and the war in Ukraine have affected businesses worldwide and thus leading to revenue decline for the businesses (Shaikh, 2021; Mariotti,

2022). This is because there have been economic and social disruptions which have created multiple challenges for the private sector (Meyer, Prescott & Sheng2022). Firstly, firms are facing lower demand for goods and services and the supply chains have been disrupted, restricting access to intermediate goods and labor. Thirdly, access to cash and credit is deteriorating and uncertainty is dampening investment and innovation prospects (Meyer, Prescott & Sheng, 2022). The reduction in cash flow has had a large impact on sales of firms and lower demand is more severely affecting sales of businesses (Shaikh, 2021).

According to a central banks survey by Auer, Cornelli and Frost (2020), the announcement of Facebook's Libra in 2019 was a tipping point to urge the development of central bank digital currencies (CBDCs). The use of interoperable digital payment methods for revenue collection also presents a variety of opportunities and empowers businesses to achieve customer-centric marketing strategies. Most companies use marketing solutions and mostly concentrate on enhancing customers' online experience. This has resulted in an increase in the desire for integrated solutions across various industry sectors, which is creating ample opportunities (Hassani, Huang & Silva, 2018).

Interoperability refers to the basic ability of computerized systems to connect and communicate with one another readily, even if they were developed by widely different sectors in different industries (Noura, Atiquzzaman & Gaedke, 2019). Being able to exchange information between applications, databases, and other computer systems is crucial for the modern economy. The world is getting smaller and smaller as more people connect with one another over networked computerized systems. Enhanced connections speed up reaction times as people can transact more easily, but there are also gains being made as various software and computer systems link up with one another for automated data sharing (Dahlberg, Guo & Ondrus, 2015). With so many complex systems being networked together, issues of interoperability should be on the minds of people working in all types of industries, with retail merchant being no exception (Noura, Atiquzzaman & Gaedke, 2019).

The awareness about abilities of digital payment interoperability services in providing economic benefits to the society at much lower than cash and card-based solutions, is wide spreading making digital payment a convenient lifestyle (Rahayu, 2022). The ability to implement services to merchant and consumer at the same time has made digital payment more convenient (Moghavvemi et al., 2021). Digital payment interoperability is not mere

mobilization of digital payment, it also plays a significant role in the growth of m-commerce as it is heavily dependent on the acceptance of digital payment interoperability by consumers (Yang et al., 2015). It provides consumers with an all-time financial access through which people can pay for anything e.g., transportation tickets or car parking, electronic billing, digital content such as ring tones, logos, news, music, or games, checking bank balances, shopping, services, fund transfer, investment and much more (Sharma, Singh & Sharma, 2020).

1.1.1 Digital Payment System

Digital payment is a method of payment in which electronic media such as short messages (SMS), internet banking, digital wallet and mobile banking are used (Franciska & Sahayaselvi, 2017). Organizations are going digital to improve their services and facilities to bring up the satisfaction level of their customers (Zhu, Lan & Chang, 2017). The idea behind digital transformation in retail is based on the needs and requirements of customers. While deciding about going digital, merchants think about how they can use emerging technologies to find new ways to drive revenue and create innovative business models (Franciska & Sahayaselvi, 2017). As digital tools and technologies emerge, they are going to have a considerable impact not only on the services offered by the merchants but also their revenue collection. It is about creating a connected engagement facilitated using technology. It is not only about data intelligence, agility, customer centricity, new value propositions and innovation, but also about reducing costs, enhancing efficiencies, and streamlining processes (Noura, Atiquzzaman & Gaedke, 2019).

Digital payment has been designed to help individual customers and companies as well as the banks themselves in eliminating or reducing some of the problems inherent in the settlement and payment process (Kanimozhi & Kamatchi, 2017). Customers can pay their bills without having to move to the bank's premises (Kanimozhi & Kamatchi, 2017). They may also have access to their account information and even transfer money to other accounts in the comfort of their homes (Kanimozhi & Kamatchi, 2017). The digital payment methods available to consumers include Electronic Funds Transfer (EFT), Automated Teller Machine (ATM), cards (debit, credit and smart), Electronic Purses/Wallets, mobile money (Mobile Banking and Money Transfer), Telephone Banking, Personal Computer Banking (Home Banking), Digitized 'E-Cash' Systems, Electronic Cheque, Online/Internet Payments and Digital Person to Person (P2P) Payments (Kesh,

2017). The content of P2P exchange is usually in the form of digital financial instrument such as encrypted credit card numbers, electronic checks, or digital cash that is backed by a bank or an intermediary, or by a legal tender (Kusi & Nyarku, 2015).

According to Rahayu (2022), for the achievement of effective and efficient retail payment systems, it's important to ensure the convenience, reliability and security of the payment method. It's also important to ensure the service quality, transaction speed of payment, fees charged by financial institutions, taste and demographic of customers and technological advancement in regard to the different payment systems (Shaikh & Karjaluoto, 2015). Digital payment is a convenient, safe, and secure method for payment of bills and other transactions by electronic means such as card, telephone, the Internet, Electronic Fund Transfer. Electronic payment gives consumers an alternative to paying bills and debts by cash, cheque, and money order (Afaha, 2019).

1.1.2 Digital Payment Interoperability

Digital payments interoperability is where various digital payment platforms are allowed to interact with one another and thus customers can be able to make payments from different bank using one device or from the mobile money account of one provider to the mobile money account of another provider (Franciska & Sahayaselvi, 2017). Organizations are entering into digital payment interoperability so as to enhance improvement of their services and facilities so as to enhance customer satisfaction (Chiu & Wong, 2022). The idea behind digital payment interoperability in retail is based on the needs and requirements of customers. While deciding about going digital, merchants think about how they can use emerging technologies to find new ways to drive revenue and create innovative business models (Milkau & Bott, 2015). As digital tools and technologies emerge, they are going to have a considerable impact not only on the services offered by the company but also its organization of the workflow (Bourreau & Valletti, 2015).

An important step to derive more value from digital payment is through interoperability, that is, integrating business processes, systems, and applications to create synergy across multiple payment platforms, regardless of the service provider (Ogbanufe & Kim, 2018). Digital payment interoperability is about thinking beyond marginal improvements. It is about creating a connected engagement facilitated using technology. It is not only about data intelligence, agility, customer centricity, new value propositions and innovation, but also about reducing costs, enhancing efficiencies, and streamlining processes (Milkau &

Bott, 2015). Digital payment interoperability has led to merchants re-considering every aspect of their business, from sourcing to inventory management, employee management and training and customer experience management. Digital payment interoperability can drive customer retention and satisfaction by offering convenience that is sort after by customers in fulfilling their needs (Bourreau & Valletti, 2015).

Digital payment interoperability enhances acceptability of transactions as there is better service delivery and hence customers are satisfied with the services provided. The speed of transactions is also enhanced as the more the transaction speed is, the better the customer satisfaction. Traceability is also enhanced as there is better access and tracking of any or all information about transactions in digital payments (Rahayu, 2022). Digital payment interoperability process provides assurance to the customer that all system elements will function. Interoperability extends to the holistic notion that involves all the organizational components of an enterprise during the entire cycle of the acquisition process (Bourreau & Valletti, 2015). Digital payment interoperability solutions for organizations require comprehensive integration strategies that go beyond simple connections. Largely, successful integration depends on maintaining a system perspective (Bourreau & Valletti, 2015). Digital payment interoperability consists of a network of interrelated entities that accelerate data exchange between systems to initiate, sanction, and expedite cash transfer between two parties (Milkau & Bott, 2015).

1.1.3 Effect of Digital Payment Interoperability on Revenue Collection

According to Sagarik (2021), the use of digital payment interoperability systems such as e-payment would considerably increase the revenue collection as it helps in tracking stock for merchants. It enhances acceptability of transactions which is quality of digital payments being satisfactory and able to be agreed to or approved of by the customers (Saini, 2017). It also enhances the speed of transactions, which is the amount of time a digital platform takes to perform a transaction. The more the transaction speed is, the better the customer satisfaction and provides more system availability and faster process (Hassani, Huang & Silva, 2018). Digital payment interoperability enhances traceability of transactions which is the ability to access and track any or all information about transactions in digital payments by using a system of recorded identifications (Bevilacqua, Ciarapica & Giacchetta, 2009).

Thus, the implementation of digital payment interoperability is paramount in ensuring optimal revenue collection. Various digital payment interoperability-based revenue collection applications are available for use in the modern world today. These are simply referred to as Electronic Payment (E-payment) system (Okiro, 2015), integrated into revenue collection. The Digital payment system is accessible online through Point of Sale (PoS) terminal devices and physical agents (such mobile phones, debit cards, agents, mobile money) (Cabanillas, Luna & Ríos, 2017). The Digital payment interoperability is intended to help the companies using it to eliminate or reducing and minimizing corruption (some of the problems inherent in the settlement and payment process), by allowing customers to pay their bills without having to move to the firm premises. The customers have access to their account information and even transfer money to other accounts in the comfort of their homes (Sagarik, 2021).

1.1.4 Supermarkets in Kenya

Kotler and Armstrong (2008) define a supermarket as a form of grocery self-service store that offers a wide variety of food and household commodities prearranged into departments. It is relatively bigger than a traditional grocery store and offers relatively low cost, high volume, products and services. Many Kenyans prefer shopping in supermarkets as they get everything under one roof and at affordable prices. The major supermarkets in Kenya are Chandarana Foodplus, Carrefour Kenya, Naivas, Quickmart, Eastmatt, Mathais Supermarket and Magunas Supermarket. The list of supermarkets in Nairobi County that will be considered for the study is under Appendix I (Retail Trade Association of Kenya Report, 2021).

In Kenya the 2020 period recorded subdued performance in the supermarket sector resulting from the tough operating environment as the economy grappled with effects of the Coronavirus pandemic. This was evidenced by the scaling down of supermarket such as Tuskys that faced financial woes (Kenya Retail Sector Report, 2020). During the Coronavirus pandemic, the key challenges that faced the supermarket sector were constrained access to credit due to high risk of default in payment, with private sector credit growth coming in at 7.6% as of June 2020 similar to a 5-year average of the same. Constrained spending power among consumers due to a tough economic environment, and growing focus on e-commerce thus reduced demand for physical retail space (Kenya Retail Sector Report, 2020). However, as more shoppers increasingly rely on digital methods to

purchase products and services from supermarkets some malicious/bad actors have spotted an opportunity to exploit online security vulnerabilities and steal sensitive personal information (Toh & Tran, 2020).

1.2 Statement of the Problem

The world today is glaring at a global recession driven by the effects of Covid 19 pandemic and the war in Ukraine, economies and businesses by extension have been adversely affected (Shaikh, 2021; Mariotti, 2022). Organizations are faced with depressed performance driven by a drop in revenues as households reduce their spending in order to adjust to the pressures of a depressed economy and reduced purchasing power (Zhang, Hu & Ji, 2020). Organizations and businesses are therefore forced to restructure their operations and processes (leveraging on innovation and technology) to safeguard their declining top line revenues. Digital payment interoperability is one of the innovations that is gaining popularity in many developed countries and is further considered an integral part of e-payment that can be used to save time, effort, and money (Noura, Atiquzzaman & Gaedke, 2019).

Although consumer adoption of digital payments has improved dramatically, acceptance and usage of digital payments interoperability by Merchants in Kenya has experienced some challenges (Ndung'u, 2019). This is because digital payments interoperability carries a greater risk of data breaches and cyber security risks such as hacking, Ransomware and distributed denial of service attacks. Thus, consumers must therefore take additional precautions to protect themselves (Riantini, Bismo & Rabiah, 2020). While businesses have a significant financial incentive to accept digital payments interoperability, it is critical that they understand the main security risks associated with them and put the right protocols in place to mitigate the risk to themselves and customers.

Gaps still exists regarding digital payment interoperability adoption; Riantini, Bismo and Rabiah (2020) studied user's acceptance of digital payment services in Indonesia and established that trust, perceived usefulness, and perceived risk affect customer's acceptance of digital payment. A contextual gap exists as the study was not in supermarkets while a conceptual gap exists as the study focus was not on digital payments interoperability on revenue collection. Mbwayo (2017) focused on factors influencing adoption of E-payments by commercial banks in Kenya and found that information security, infrastructure and technology influenced uptake of E-payments. A contextual gap existed as the study was

not in supermarkets while a conceptual gap exists as the study focus was and not on digital payments interoperability on revenue collection. This study was thus timely in determining the effect of digital payments interoperability on revenue collection for major supermarkets in Nairobi, Kenya.

1.3 Objectives of the Study

1.3.1 General Objective of the Study

To determine the effect of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya.

1.3.2 Specific Objectives of the Study

The study was guided by the following objectives.

i. To determine the effect of acceptability of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya.
ii. To investigate the effect of speed of transactions, of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya.
iii. To determine the effect of traceability of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya.
iv. To investigate the moderating effect of security on digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya.

1.4 Research Questions

i. What is the effect of acceptability of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya?
ii. To what extent does speed of transactions of inter-operatable digital payments affect revenue collection for supermarkets in Nairobi, Kenya?
iii. What is the effect of traceability of inter-operatable digital payments on revenue collection for supermarkets in Nairobi, Kenya?
iv. What is the moderating effect of security on digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya?

1.5 Scope of the Study

This study focused on the effect of digital payments interoperability on revenue collection for merchants in form of supermarkets in Nairobi, Kenya. The specific variables that were to assess the effects of acceptability of digital payment, speed of transactions of digital payment and traceability of digital payment on revenue collection for merchants in form of supermarkets in Nairobi, Kenya. The study targeted 18 supermarkets where the focus was on 90 employees from accounting, finance, information communication technology (ICT), operations and procurement departments. The researcher employed primary data which was collected through a questionnaire that was closed ended. The study was undertaken from January 2023 to April 2023.

1.6 Significance of the Study

The policy makers may benefit from the findings of the study in that it may be able to formulate effective strategies for enhancing security of digital payments in Kenya which may in turn enhance acceptability by the consumer. Through having in place good policies for operation of digital payment this may in turn increase their interoperability in the market.

The management of supermarkets and in particular the supermarkets in Nairobi Kenya under focus may benefit from the study as they may be able to know ways that they can encourage their customers to adopt digital payment methods. The management may also know ways they can collaborate with banks to enhance security of digital payment platforms which may in turn enhance their acceptability, speed of transactions and traceability of digital payment that may then enhance revenue collection.

The findings of this study may contribute to the knowledge and policy implementation on the impact of interoperability on the growth of business and value addition in business processes. The study may add value to the existing literature and may establish the gaps for future research on the same or similar topic by suggesting areas that need further studies to be conducted.

1.7 Limitations of the Study

The study anticipated some limitations that might hinder access to information that the study sought. The respondents targeted in this study may have been reluctant in giving

information due to data privacy and sensitivity of the information being sought, especially on revenue collections. The researcher hoped to handle this by carrying an introduction letter from the University to assure the respondents that, the information they give would be treated with confidentiality and be used purely for academic purposes. Further, the results were limited to the extent to which the respondents were willing to provide accurate, objective, and reliable data. The researcher checked for consistency and tested the reliability of the data collected.

1.8 Chapter Summary

This chapter focused on background of the study, statement of the problem, objectives of the study which was to determine the effect of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya. The specific objectives were also covered which were to determine the effect of acceptability of digital payments interoperability, speed of transactions, traceability of digital payments interoperability and the moderating effect of security on digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya. The chapter also covers research questions, scope of the study, significance of the study and limitations of the study.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

The chapter presents a review of relevant literature. This includes theoretical foundation, empirical studies, summary of knowledge gaps, conceptual framework, conceptualization, operationalization, and measurement of variables.

2.2 The Theoretical Foundation

2.2.1 Technology Acceptance Theory

This model clarifies the way clients embrace/acknowledge and utilize an innovation. TAM was developed in 1989 by Davis. This model asserts that once a client is given an alternative innovation, some aspects influence their choices on the means and time of utilization. This incorporates its apparent convenience and seen helpfulness. TAM embraces settled causal chain of genuine conduct convictions, goal, and disposition. This was produced by social clinicians from the hypothesis of contemplated activity. In Davis' study, two vital parts are recognized: seen convenience and seen helpfulness (Davis, Pallister & Foxall, 2002). TAM is widely adopted and greatly contributes to the development of a prediction of an individual's usage of technology (Fishbein & Ajzen, 2010). Perceived ease of use influences the perceived usefulness and the intention for adoption (Davis, 1989).

Despite TAM being an important source for theoretical framework in the study of adoption and use of technology it has many limitations which include the initial purpose designing the model which is parsimony and generality (Dishaw & Strong, 1999), not taking into consideration non-organizational setting of the organization (Davis & Venkatesh, 2000), and ignoring the factors which moderate the adoption of ICT (Sun & Zhang, 2006). TAT primarily focuses on individual-level factors, such as perceived usefulness and perceived ease of use, in determining technology adoption. This approach overlooks the broader socio-cultural and organizational factors that influence technology acceptance. It fails to adequately consider the impact of social norms, organizational structures, and contextual factors that can significantly affect users' adoption decisions. TAT often treats technology adoption as a one-time event and does not fully account for the dynamic nature of technology acceptance over time (Davis & Venkatesh, 2000)

TAM posits that there are two factors that determine whether a technology will be accepted by its potential users; that is, perceived usefulness and perceived ease of use (Davis, 1989). Hence TAM will be relevant in the present study as it will help organization understand how they can ensure that various digital payment systems are interlocked to make them efficient and easy to use and thus enhances revenue collection for merchants in supermarkets in Nairobi, Kenya.

2.2.2 Transactions Cost Theory

The Transaction cost economics theory was postulated by Williamson (1981) and states that transaction costs arise every time a product or service is being transferred from one stage to another, where new sets of technological capabilities are needed to make the product or service. It further states that the transaction costs related to the exchange of resources with the external environment could be reflected by environmental uncertainty, opportunism, risks, bounded rationality, core company assets (Alaghehband et al., 2011). These factors above will all potentially increase the external transaction costs, where it may become rather expensive for a company to control these factors (Alaghehband et al., 2011). Therefore, it may very well be more economical to maintain the activity in-house, so that the company will not use resources on e.g., contracts with suppliers, meetings, and supervision. Therefore, if companies see the environmental uncertainty as high, they might choose to not outsource or exchange resources with the environment (Schmidt & Wagner, 2019).

Transactions Cost theory (TCT) suffers from criticism in that TCT primarily focuses on transaction costs, such as information search, negotiation, and enforcement costs. While these costs are undoubtedly important, TCT tends to overlook other factors that can influence economic behavior and decision-making, such as social norms, trust, and relational factors. TCT predominantly considers transaction costs in monetary terms and may not fully capture the broader range of costs and benefits associated with transactions (Jumba & Wepukhulu, 2019). TCT often assumes that individuals and organizations are solely motivated by self-interest and seek to minimize transaction costs. However, human behavior is complex, and individuals may have diverse motivations and goals beyond cost minimization. TCT tends to view transactions as discrete and static events, without fully considering the dynamic and evolving nature of economic relationships (Schmidt & Wagner, 2019).

Firms intending to adopt cashless payments must choose between two options that is to purchase a cashless payment system from the vendors or to build its own cashless payment system to reduce its operational costs (Jumba & Wepukhulu, 2019). The first option is considered as "a market based" mechanism in which organizations try to find the best product in the market to suit their needs. This option shows that the transaction costs include the costs of finding information on cost and acceptability of the best payment system for the firm (Williamson, 1993). The second option can be called "vertical integration" in that all costs of building the payment platform press on the organization through hierarchical means (Williamson, 1993). Transaction cost theory posits that the optimum organizational structure is one that achieves economic efficiency by minimizing the costs of exchange. Thus, the theory was relevant in this study as it seeks to establish how various digital payments platforms can be interpolated to enhance efficiency of transacting business and thus ease in revenue collection.

2.3 Empirical Literature

2.3.1 Digital Payments Interoperability Acceptability and Revenue Collection

Temba (2018) conducted a study on user acceptance of electronic fiscal device (EFD) as a new tool for tax collection: a case of Traders Ilala tax region in Dar es Salaam, Tanzania. The variables were user involvement and user acceptance. Data collected was analyzed into frequency tables, cross tabulations, pie charts and bar charts. Findings revealed that the majority of business operators have some partial elementary skills on the usefulness of Electronic Fiscal Device (EFD) in their business. Majority of traders seem to dislike the idea of using EFD due to the following reasons highlighted by; respondents take long time to process one transaction (Pacing is not comfortable), difficulty in getting maintenance in case traders encounter any problem, high price as well as unreliable network that hinders effectiveness in undertaking transactions. The context of the study differs from the current study since the study was conducted in Dar es Salaam, Tanzania while the current study was conducted in Kenya thus presenting contextual gaps. A conceptual gap also exists as the study focus was on user acceptance EFD while the current study focuses on digital payments interoperability on revenue collection.

Okiro (2015) evaluated the effect of E-Payment system on revenue collection by the Nairobi City County Government. The study sought to addresses; level of compliance to

budget estimates, and absorption of the e-payment by the payers, resulting from the e-payments system as factor influencing performance of revenue collection by the County Government in an effort to recommend on ways to ensuring optimal revenue collection. Data was collected from secondary sources and analyzed, with respect to the study objectives using both descriptive and inferential statistics. The study found that the revenue collection performance in Nairobi City County increased considerably after the introduction of e-payment system in revenue collection. The study concludes that the adoption of an e-payment system positively influences the revenue collection performance in Nairobi City County. The study recommends that the Government of Nairobi City County should ensure that all its wards, departments and other related units are compelled by regulations to adopt e-payment and other ensure management of revenue collection system to lead to assurance total compliance to the budgets and there should be awareness campaigns to ensure that the consumers get the right information as pertains to e-payment revenue collection. A gap exists as the study context was Nairobi City County Government while the present study focuses on supermarkets in Nairobi while conceptual gap exists as the study focused on E-Payment system while the current study focuses on digital payments interoperability on revenue collection.

2.3.2 Speed of transactions for Inter-operatable Digital Payments and Revenue Collection

Grace (2022) assessed the effect of electronic payment systems on revenue collection of water utilities in Uganda: A Case of National Water and Sewerage Corporation (NWSC) - Kabale Branch. The variables were the contribution of e-payment methods; revenue collection performance; and challenges faced by National Water and Sewerage Corporation staff and customers in revenue collection. The study design was both descriptive and correlational. The study covered staff and clients of NWSC. Primary and secondary data were collected and analyzed with the aid of SPSS. Secondary data on revenue collection from 2011 to 2020 was analyzed. The study found that electronic payment systems do not have a significant contribution to revenue collection. The study found a strong and significant relationship between electronic payment systems and revenue collection but limited by network inconsistencies. A contextual gap exists as the study focus was on NWSC in Uganda and not in supermarkets in Nairobi while a conceptual gap exists as the focus was on speed of transactions of electronic payment systems while the present study is on digital payments interoperability on revenue collection.

Munyao (2020) sought the effects of e-payment system on revenue performance. The variables were benefits of e-payment system challenges of e-payment system and e-payment strategies. Sampling frame was obtained from the human resource office at Sarova. Stratified sampling technique was deployed in the study. A sample size of 65 respondents was studied. A questionnaire was used for data collection and both descriptive and inferential statistics were deployed. The findings revealed that there exists a significant relationship between e-payment benefits, e-payment challenges, e-payment strategies, and revenue performance. This study concludes that e-payment technology enhances convenience as it allows customers to pay for services at their own comfort and thus increases sales. This study also concludes that electronic payment technology is essential for the hotel to have a global presence in terms of market expansion. This study concludes that electronic payment enhances cost reduction in the organization. A contextual gap exists as the study focus was on hotel industry and not in supermarkets in Nairobi while a conceptual gap exists as the focus was on speed of transactions e-payment system while the present study is on digital payments interoperability on revenue collection.

2.3.3 Traceability of Inter-operatable Digital Payments and Revenue Collection

Yaqub et al. (2022) conducted a study to determine the role of web-design, e-payment, and e-traceability in developing customer satisfaction with the mediating role of consumer behavior in emerging bricks and clicks businesses trends in South Punjab, India. The variables were web-design, e-payment, and e-traceability. In this study, random sampling technique was used to collect the quantitative data from the target population of South Punjab on a five-point Likert scale questionnaire. The study demonstrates there is a significant role of web-design, e-payment, and e-traceability in developing customer satisfaction with the mediating role of consumer behavior which enhances revenue growth. A gap exists as the study focused on e-traceability on revenue growth in India while the present study focuses on digital payments interoperability on revenue collection for supermarkets in Nairobi.

Mtebe and Sausi (2021) evaluated the revolutionization of revenue collection with government e-payment gateway system in Tanzania. This study evaluated the performance of the system by drawing success measures based on public value: efficiency, effectiveness, and social value. The study adopted a concurrent mixed research design where the questionnaire was integrated within interviews in a single investigation involving 442

respondents from 271 public institutions in 11 regions in Tanzania. The study found that the use of the system increased revenue collection by 44.28% while reducing the cost associated with revenue collection by 27.10% between 2015/2016 and 2019/2020 in the surveyed institutions. Moreover, the use of the system enhanced the trust between citizens and government, increased transparency, and traceability in the process of revenue collection. A gap exists as the study focus was on revolutionization of revenue collection with government e-payment in Tanzania while the current study focus is on digital payments interoperability on revenue collection for supermarkets in Nairobi.

2.3.4 Security of Interoperability of Digital Payments and Revenue Collection

Kishura (2020) conducted a study on the impact of security of electronic payment systems revenue collection: a case of ministry of finance and planning – Tanzania. The variables were use, performance, the challenges and security. Data were collected from 98 workers in ICT and other related departments in the Ministry of Finance and Planning. The results were analyzed by using SPSS version 20, whereby a descriptive statistic was employed. The study found that the system of revenue collection was not good before the applicability of GePG, but the system improved after the applicability of Government e-Payment Gateway. All in all, the GePG, as a system of managing public finance has been experiencing system security attack, lack of information sharing between institutions and the problem from other institutions. A gap exists as the study focus was on security of electronic payment systems on revenue collection in Tanzania while the current study focus is on digital payments interoperability on revenue collection for supermarkets in Nairobi.

Mwasaru (2020) sought to find out the factors influencing revenue collection through mobile money transfer in Kenya Revenue Authority (KRA) Malindi Station. The variables were the transfer cost, user interface and platform security. The researcher used quantitative and qualitative research designs. It was conducted at the Southern Region, Malindi station KRA office. The target population was at Malindi station SMEs turnover taxpayers 272. Simple Random sampling was used and qualitative methods of data collection instrument was used, a key informant interview guide with a questionnaire. The analysis showed that the relationship between platform security and revenue collection has a significant effect on revenue collection through mobile transfer (β=0.701; p=0.000). A gap existed as the study focus was on factors influencing revenue collection through mobile money transfer

in KRA while the current study focus is on digital payments interoperability on revenue collection for supermarkets in Nairobi.

2.4 Summary of Knowledge Gaps

Table 2.1: Summary of Knowledge Gaps

Author	Topic	Methodology	Findings	Research Gaps
Temba (2018)	User acceptance of EFD as a new tool for tax collection: a case of Traders Ilala tax region in Dar es Salaam, Tanzania	Data was collected using a questionnaire and analyzed into frequency tables, cross tabulations, pie charts and bar charts	Majority of traders seem to dislike the idea of using EFD due to long time to process one transaction, difficulty in getting maintenance in case traders encounter any problem, high price as well as unreliable network that hinders effectiveness in undertaking transactions	The context of the study was in Dar es Salaam, Tanzania while the current study was conducted in Kenya. A conceptual gap also exists as the study focus was on user acceptance EFD while the current study focuses on digital payments interoperability on revenue collection
Okiro (2015)	Effect of E-Payment system on revenue collection by the Nairobi City County Government	Data was collected from secondary sources and analyzed, with respect to the study objectives using both descriptive and inferential statistics	Revenue collection performance in Nairobi City County increased considerably after introduction of e-payment system in revenue collection	A gap exists as the study context was Nairobi City County Government while the present study is on supermarkets in Nairobi while conceptual gap exists as the study focused on E-Payment system while the current study focuses on digital payments interoperability on revenue collection

Grace (2022)	Effect of E-payment systems on revenue collection of water utilities in Uganda: A Case NWSC	Descriptive and correlational research design was adopted. Secondary data on revenue collection from 2011 to 2020 was analyzed.	Electronic payment systems do not have a significant contribution on revenue collection	A contextual gap exists as the study focus was on NWSC in Uganda and not in supermarkets in Nairobi while a conceptual gap exists as the focus was on speed of transactions of electronic payment systems while the present study is on digital payments interoperability on revenue collection.
Munyao (2020)	The effectiveness of Electronic Payment System on Revenue Performance in Kenya's Hotel Industry: A Case of Sarova Hotels	Stratified sampling technique was deployed and a questionnaire was used for data collection and both descriptive and inferential statistics	E-payment technology enhances convenience as it allows customers to pay for services at their own comfort and thus increase sales	A contextual gap exists as the study focus was on hotel industry and not in supermarkets in Nairobi while a conceptual gap exists as the focus was on speed of transactions e-payment system while the present study is on digital payments interoperability on revenue collection.
Yaqub et al. (2022)	Role of web-design, e-payment, and e-traceability in developing customer satisfaction in South Punjab, India.	Random sampling technique was used to collect the quantitative data and a five-point Likert scale questionnaire was used	There is a significant role of web-design, e-payment, and e-traceability in developing customer satisfaction with the mediating role of consumer behavior which enhance revenue growth	A gap exists as the study focused on e-traceability on revenue growth in India while the present study focuses on digital payments interoperability on revenue collection for supermarkets in Nairobi

Mtebe and Sausi (2021)	Revolutionization of revenue collection with government e-payment gateway system in Tanzania.	The study adopted a concurrent mixed research design where the questionnaire was integrated within interviews	The use of E-system enhanced the trust between citizens and government, increased transparency, and traceability in the process of revenue collection	A gap exists as the study focus was on revenue collection with government e-payment in Tanzania while the current study focus is on digital payments interoperability on revenue collection for supermarkets in Nairobi
Kishura (2020)	Impact of security of electronic payment systems revenue collection: a case of ministry of finance and planning – Tanzania	Data was analysed by using SPSS version 20 where descriptive statistic was employed	E-system of revenue collection was not good before the applicability of GePG, but the system improved after the applicability of Government e-Payment Gateway	A gap exists as the study focus was on security of electronic payment systems on revenue collection in Tanzania while the current study focus is on digital payments interoperability on revenue collection for supermarkets in Nairobi
Mwasaru (2020)	Factors influencing revenue collection through mobile money transfer in KRA Malindi Station	Simple Random sampling was used and key informant interview guide with a questionnaire was adopted	The relationship between platform security and revenue collection has a significant effect on revenue collection through mobile transfer	A gap exists as the study focus was on factors influencing revenue collection through mobile money transfer in KRA while the current study focus is on digital payments interoperability on revenue collection for supermarkets in Nairobi

Source: Author (2023)

2.5 Conceptual Framework

The conceptual framework describes the relationship between the research variables. The Independent variables are acceptability, speed of transaction, traceability, the dependent variable is revenue collection while the moderating variable is security.

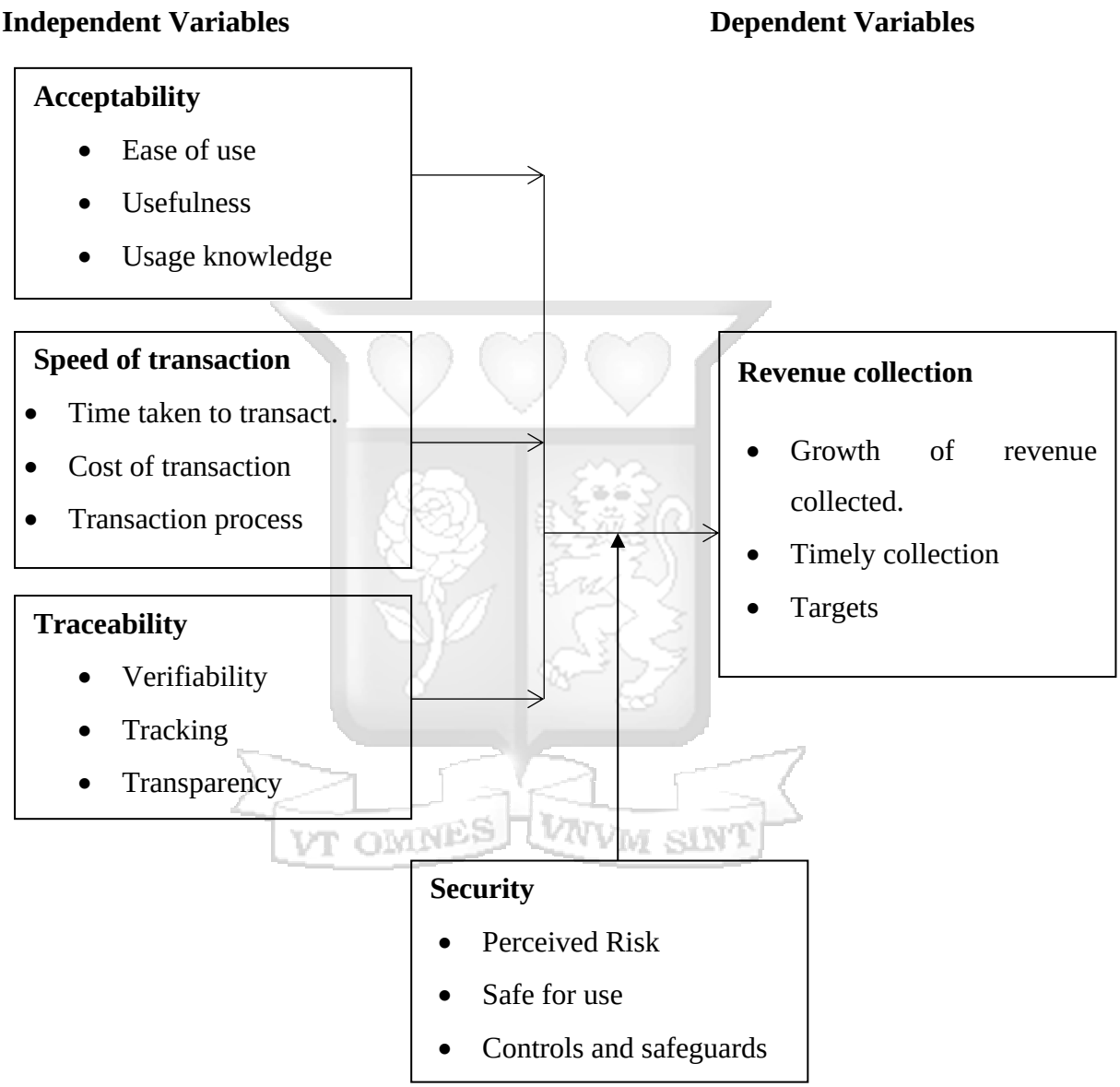

Figure 2.1: Conceptual Framework

Source: Rahayu (2022)

2.6 Conceptualization

2.6.1 Digital Payments Interoperability Acceptability

Digital payments interoperability acceptability is the degree to which various digital payment platforms that are interlocked are agreed or approved by the merchants and customers (Nwaolisa & Kasie, 2017). With the brisk development of e-commerce, e-payment systems have evolved steadily to burgeon both online as well as offline trade transactions for payment settlement. The challenge for system developers is to model their applications in coherence with the fundamental principles of human computer interaction. Failure to incorporate proper usability, security, and efficiency in system design results in complete rejection of the software product (Fatonah et al., 2018).

H_{a1}: Digital payments interoperability acceptability is positively related to revenue collection.

2.6.2 Speed of Transaction in Digital Payment Interoperability

Speed of transaction in digital payment interoperability means the amount of time various digital platforms that are interlocked take to perform a transaction (Kumar & Chaubey, 2017). Many digital payment providers offer intuitive platforms that easily integrate with all your existing systems. One can connect banks, vendors, employees, and customers into one seamless business ecosystem to streamline financial operations (Kumar & Chaubey, 2017). Slow payment methods not only keep away customers but are also a financial burden on your business. Quick payment services can make your business more efficient and profitable. Non-digital payments such as money orders and paper checks can take weeks to arrive by mail, exacerbating cash flow problems. Digital payment services make funds available within a few days to improve enterprise finances (Tan et al., 2019).

H_{a2}: Speed of transaction in digital payment interoperability is positively related to revenue collection.

2.6.3 Traceability of Digital Payment Interoperability

The traceability of digital payment interoperability is the ability to bind a transaction to originating and accepting entities resulting from the various digital platforms that are interlocked (Yu et al., 2019). Payment service providers have processes in place which

ensure that all payment transactions and other interactions with the payment services user, with other payment service providers and with other entities, including merchants, in the context of the provision of the payment service are traceable, ensuring knowledge ex post of all events relevant to the electronic transaction in all the various stages. Trust is enhanced if the participants know that the elements of a transaction may be traced from origin to completion. Thus, if there is a problem, discrepancy, or other dispute, it will be possible to work back through each step in the process to determine where the problem occurred or who may be held responsible. Receipts, sales slips and tapes, and "carbons" or other copies are examples of documents that enable traceability (Cocco et al., 2019).

H_{a3}: Traceability in digital payment interoperability is positively related to revenue collection.

2.6.4 Digital Payment Interoperability Security

Digital payment interoperability security refers to providing rules, regulations and security measures to protect a customer or partner's privacy, data and transactions resulting to payments from different digital platforms (Kadhiwal & Zulfiquar, 2017). In other words, payment security refers to the protection of a customer, vendor, or client's transactions. Payment and cash flow has and will always be one of the most crucial elements of running a business. However, although the principle of taking payment has remained consistent throughout centuries, the modern era has significantly redefined how exactly businesses take, and consumers make payments. Advancements in payment technology have made paying for goods and services quicker and easier than ever before, but the standards of payment security which businesses must uphold are more stringent than ever before (Ali et al., 2019).

H_{a4}: Security has a positive moderating effect on digital payment interoperability and revenue collection.

2.6.5 Revenue Collection

Revenue collection is the general collection of revenue for debts owed or owed revenue by persons or businesses. Revenue collection by merchants refers to revenue generation by the Company during a relevant period from sales of Company products through retail channels (Wekesa et al., 2022). Revenue collection is no easy task, but it is a necessary one. Having

a comprehensive system, ensuring proper data tracking and customer communication will dramatically facilitate revenue collection process, and help avoid major and unnecessary losses.

2.7 Operationalization and Measurement of Variables

This sub-section identifies and operationalizes the key variables independent and dependent variables of the study. The operationalized is based on how the variable has been used in the current study.

Table 2.2: Operationalization and Measurement of Variables

Variable	Measures	Data Collection tool	Data Analysis
Revenue collection- Dependent variable	• Growth of revenue collected. • Timely collection • Targets	Questionnaire in form 5-likert scale questions	Descriptive and inferential analysis
Digital payments interoperability acceptability- Independent variable	• Ease of use • Usefulness • Usage knowledge	Questionnaire in form of open ended and 5-likert scale questions	Descriptive and inferential analysis
Speed of transaction in digital payment interoperability- Independent variable	• Time taken to transact. • Cost of transaction • Transaction process	Questionnaire in form of open ended and 5-likert scale questions	Descriptive and inferential analysis
Traceability of digital payment interoperability- Independent variable	• Verifiability • Tracking • Transparency	Questionnaire in form of open ended and 5-likert scale questions	Descriptive and inferential analysis
Digital payment interoperability security- Moderating variable	• Perceived Risk • Safe for use • Controls and safeguards	Questionnaire in form of open ended and 5-likert scale questions	Descriptive and inferential analysis

Source: Rahayu (2022)

2.8 Chapter Summary

The chapter has discussed the literature review beginning with the theoretical foundation where technology acceptance theory and transaction cost theory were reviewed. Technology Acceptance Model has been one of the most influential models of technology acceptance, with two primary factors influencing an individual's intention to use new technology: perceived ease of use and perceived usefulness. A person who perceives digital payment as easy to use and useful is likely to use the digital payments and vice versa. On the other end Transaction costs make economic transactions less efficient and reduce net returns. In addition, various empirical studies have been reviewed linking the study variables in different contexts which has eventually led to the summary of the research gaps that the study sought to fill.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The research methodology section gives an outline of different methodologies used in data collection, procedures incorporated in carrying out this study, the methods applied in analyzing and interpreting the collected data.

3.2 Research Philosophy

Research philosophy relates to the development of knowledge and the nature of that knowledge (Saunders, Lewis & Thornhill 2012). There are two types of research philosophy in research that include positivism and social constructivism research philosophy. Positivism assumes in its understanding of the world that the environment and the events of interest are objective, external and independent of the researcher (Bryman & Bell, 2015). Social constructivism, however, assumes that the understanding of the environment and events in it is socially constructed and subjective from the researcher's point of view. Positivism relies on quantitative data that positivists believe is more reliable than qualitative research. Positivism believes quantitative research is more scientific in its methods than qualitative research and thus more trustworthy (Saunders, Lewis & Thornhill 2012). The positivism research philosophy was appropriate for this study since the study was quantitative in nature. This was an appropriate philosophy in determining the effect of digital payments interoperability on revenue collection for merchants in supermarkets in Nairobi, Kenya.

3.3 Research Design

A descriptive correlational research design was adopted with the aim of determining the effect of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya. Descriptive correlational research design is a type of research design used to explore the relationship between two or more variables without manipulating them. It aims to describe and analyze the existing relationship or association between variables, rather than establishing a cause-and-effect relationship (Saunders, Lewis & Thornhill, 2012). Descriptive correlational research design allows researchers to explore and describe the relationships between variables. It helps identify patterns, associations, and connections

between different variables of interest. This design is particularly useful when little is known about the relationship between variables or when researchers aim to generate new insights and hypotheses for further investigation (Saunders, Lewis & Thornhill, 2012). By exploring relationships between variables, it helps generate hypotheses and research questions for further investigation (Erik & Marko, 2011). The research design was applied in establishing the relationship between variables.

3.4 Population of the Study

Population refers to a full set of objects, cases or individuals that have some similar observable features, (Mugenda & Mugenda, 2012). The target Population is the specific population under research (Kothari, 2014). Kothari (2014) notes that the target population should be characterized by traits that can be observed and which helped the researcher generalize the whole population. The population was employees from 18 major supermarkets registered with RETRAK in Nairobi County with a branch in Nairobi and any other town, (See Appendices I) as per the Retail Trade Association of Kenya (RETRAK) report 2021. The target population was 468 employees (Human Resource Departments, 2023) from finance, sales & marketing, ICT, operations and procurement departments from the 18 supermarkets.

3.5 Sampling Technique

According to Erik and Marko (2011) sampling is the process of selecting a number of individuals for a study in such a way that the individual represents a true representation of the group from which they are selected. A sample is a small group obtained from accessible population (Mugenda & Mugenda, 2012). Sampling method is the procedure a researcher uses to gather people, places or things to study (Kombo & Tromp, 2014). The study used purposive sampling where all the 90 heads of departments from the supermarkets were selected as respondents. Purposive sampling, also known as judgmental or selective sampling, is a non-probability sampling technique used in research. It involves selecting individuals or cases for a study based on a specific purpose or criteria defined by the researcher (Saunders, Lewis & Thornhill 2012). Purposive sampling is often used when researchers aim to study a particular subgroup or when they seek participants with specific characteristics or experiences relevant to the research topic (Saunders, Lewis & Thornhill 2012).

The study targeted 90 heads of departments from finance, sales & marketing, information communication technology (ICT), operations and procurement departments. The five departments were selected since they interact with sales and revenue components within the organizations whereas the heads of departments were selected since they have visibility across the organization and experience required to understand the concept of digital payment interoperability and its relevance on revenue collection.

Table 3.3: Target Population

Population Category	Population Frequency	Percentage (%)
Finance Department	18	20
Sales & Marketing	18	20
ICT Department	18	20
Operations Department	18	20
Procurement Department	18	20
Total	90	100.0

3.6 Data Collection

Data collection enables the researcher to accumulate information about people, objects or a phenomenon and about the setting in which they occur and are essentially categorized into primary and secondary data collection methods (Cooper & Schindler, 2011). The researcher intends to employ primary data which was collected through structured questionnaire that was closed ended. The closed-ended questions were in the Likert scales because they are reliable and give increased data volumes as compared to the rest of the scales. The questionnaire contained background information of respondents as well as questions in regard to the objectives of the study. The first section of questionnaire contained demographic information, the second contained information in regard to acceptability of digital payments, the third speed of transactions of digital payments, fourth traceability of digital payments, fifth security of digital payments and finally information on revenue collection.

Primarily, researchers deal with generating, collecting, collating, analyzing data and drawing inferences from them. Protocol for data collection was followed attentively. The researcher first sought approval from the University Ethics Board before the research study began. Thereafter, an approval was sought for collection of data from the National

Commission for Science, Technology, and Innovation (NACOSTI) in Kenya, an agent of the Ministry of Education. Upon receiving the approvals, the researcher visited the management of the supermarkets to seek approval for data collection. The research used google forms and hard copy forms in the data collection process.

3.7 Data Quality

The researcher observed data quality by ensuring that the techniques and reports used are reliable to produce consistent reports when used by other researchers. The researcher conducted a pilot study where 10 employees from the supermarkets were used as the pilot group, but they were not involved in the actual study. Validity was enhanced by making sure the questions were clear and unambiguous and reflected the research idea.

3.7.1 Reliability of Instruments

Reliability is the measure of whether one gets a similar result through the use of an instrument for measuring an item more than one time. A specific measure is considered to be reliable if its application on the same object of measurement number of times produces the same results (Bryman & Bell, 2015). Reliability is evaluated repeatedly through using a test–retest reliability approach of the Cronbach Alpha measure of internal consistency (Cooper & Shindler, 2011). For this study reliability was measured using Cronbach alpha. It tests internal consistency used to calculate correlation values among responses on an assessment tool. The 0.70 is the level acceptable, that is the desirable reliability (Bell & Bryman, 2015).

Table 3.4: Reliability Analysis Results

Factor	Cronbach's Alpha	Comments
Acceptability	0.794	Accepted
Speed of transactions	0.796	Accepted
Traceability	0.777	Accepted
Security	0. 812	Accepted
Revenue collection	0.82	Accepted

After the test, all the alpha characteristics were more than 0.7 as shown in Table 3.5. acceptability had an alpha estimation of 0.794, speed of transactions had Cronbach's alpha estimation of 0.796, traceability had Cronbach's alpha1estimation of 0.777, security

had Cronbach's alpha1estimation of 0.812 while revenue collection had a Cronbach's alpha estimation of 0.82. This was an indication that the questionnaire was reliable.

3.7.2 Validity of Instruments

According to Cooper and Shindler (2013) validity is the degree by which the sample of test items represents the content the test is designed to measure. There are seven key types of validity in research that include face validity, content validity, construct validity, internal validity, external validity, statistical conclusion validity and criterion-related validity. However, content validity was applied in this research which measures the level by which collected data by use of particular instruments mirrors a particular content or domain of specific concept. To achieve this, the questionnaire was proofread to ensure that there are no errors both typographical and in form. To determine the validity of the questionnaire, it was necessary to pretest it before actually using it. The pretesting of the research instruments ensured that the instruments are valid in that they are able to measure the concept(s) it is intended to measure.

3.8 Data Analysis

The collected data was in the quantitative form where descriptive and inferential statistics were used in analyzing the data quantitatively. The quantitative data in descriptive form was in the form of mean, standard deviation, frequency and percentages. Inferential statistics in the form of simple and multiple regression analysis were also used. Analysis of data was carried out by employing SPSS version 25 and the results are presented in the form of tables.

A multiple linear regression model was used in establishing the relationship amongst the independent variables combined and dependent variable. Simple linear regression was also used to show the relationship between each independent variable and dependent variable. According to De Veaux, et al., (2012 pg. 789), Randomization assures us that the data are representative of some identifiable population. Once you have the population there is minimization of biases. He went on further to state that “Regression methods are often applied to data that were not collected with randomization.”

The first regression model was as follows without moderating variable:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where:

Y = Revenue collection

X_1= Acceptability

X_2= Speed of Transaction

X_3= Traceability

$\beta 0$ = Constant Term; β_1, β_2, and β_3 = Beta coefficients which were employed for measuring dependent variable's sensitivity (Y) to a change in a unit of predictor variables.

ε = Error term

The second regression model was as follows with moderating variable:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where:

Y = Revenue collection

X_1= Acceptability

X_2= Speed of Transaction

X_3= Traceability

X_4= Security

$\beta 0$ = Constant Term; β_1, β_2, β_3 and β_4 = Beta coefficients which were employed for measuring dependent variable's sensitivity (Y) to a change in a unit of predictor variables.

ε = Error term

3.9 Ethical Considerations

The researcher sought the necessary approvals before the research began where ethical clearance was sought from the University Ethical Review Board (ERB) and the National Commission for Science, Technology and Innovation (NACOSTI). The research upheld the ethical rights of the respondents when administering the questionnaire. The respondents were assured that their identity and the information provided remain confidential and would not be used against them. Anonymity was maintained whereby the researcher instructed the respondents that they need not indicate their identities in the given questionnaires. The researcher sought the consent of the respondents before administering the questionnaires to

them and emphasized that responding to the questionnaire is voluntary. The respondents maintained the right to withdraw from the study at any point in the study.

3.10 Chapter Summary

This chapter presents the research methodology which was applied in analysis of questions of research. The study adopted a descriptive correlational research design. The population of interest was heads of departments from major supermarkets in Nairobi by branches (See Appendices I) as per the Retail Trade Association of Kenya (RETRAK) report 2021. The study targeted 90 employees from finance, human resource, information communication technology (ICT), administration and procurement departments. A census was conducted on all the 90 Heads of Departments who are relevant for the study, based on Purposive Sampling done. The study further, used structured close ended questions to collect primary data. Analysis was done quantitatively by employing inferential and descriptive statistics. Presentation of data was done through frequencies, mean, standard deviation and percentages and presented in form of tables.

CHAPTER FOUR

PRESENTATION OF RESEARCH FINDINGS

4.1 Introduction

The chapter presents the results of the study, as well as an analysis of those results. The researcher presents the data that was collected during the study in a clear and organized manner. The data can be presented using tables and charts. The researcher also provides an explanation of the findings and how they relate to the research questions.

4.2 Response Rate

The researcher handed out 90 questionnaires to respondents in the 18 supermarkets. Of the 90 questionnaires distributed, 79 were filled and returned, resulting in a response rate of 87.7%. Kothari (2014) considers a response rate of 50% as satisfactory and more than 70% as excellent. Mugenda and Mugenda (2012) define a response rate of 50% as sufficient, 60% as very good, and over 70% as excellent. Therefore, the study's response rate was sufficient based on this data.

4.3 General Information

The study obtained general information of the respondents as presented in this section. The general information includes the gender, age, education level and experience of the respondents.

4.3.1 Respondents' Gender

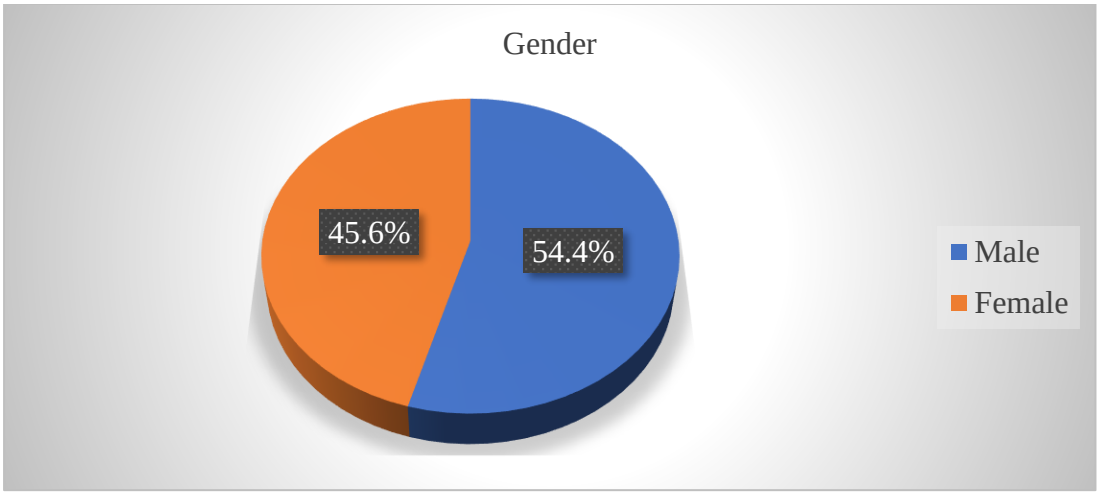

Figure 4.2: Gender

The findings show that majority of the respondents (54.4%) were male and 45.6% were female. The findings reveal that there was no major gender biasness among the supermarket employees and the study respondents.

4.3.2 Respondents' age

Table 4.5: Age in years

	Frequency	Percent
20-30 years	21	26.6
31-40 years	30	38.0
41-50 years	22	27.8
51-60 years	6	7.6
Total	**79**	**100.0**

The findings revealed that 38% of the respondents were between 31-40 years of age, 27.8% were 41-50 years, 26.6% were at the age of 20-30 years while 7.6% were at the age of 51 and above. The findings imply that the respondents were of diverse age brackets with the majority being middle aged.

4.3.3 Highest Education Level

The study obtained data on the respondents' highest level of education.

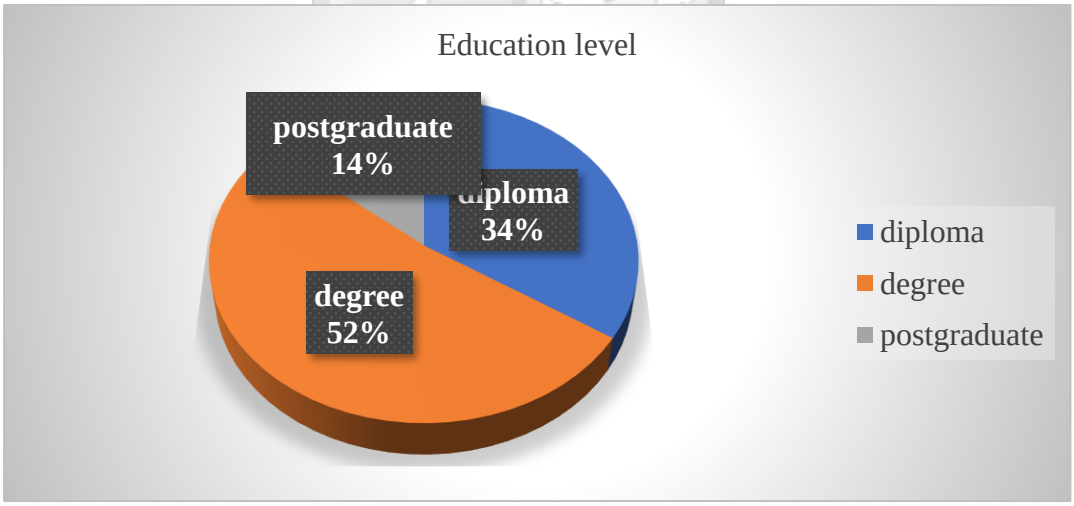

Figure 4.3: Highest level of education

The study results show that slightly over half of the respondents (52%) had bachelor's degree level of education, 34% had diploma and 1% had postgraduate.

4.3.4 Experience in Terms of the Number of Years

The study further enquired on the respondents' experience in terms of the number of years working in supermarket/s.

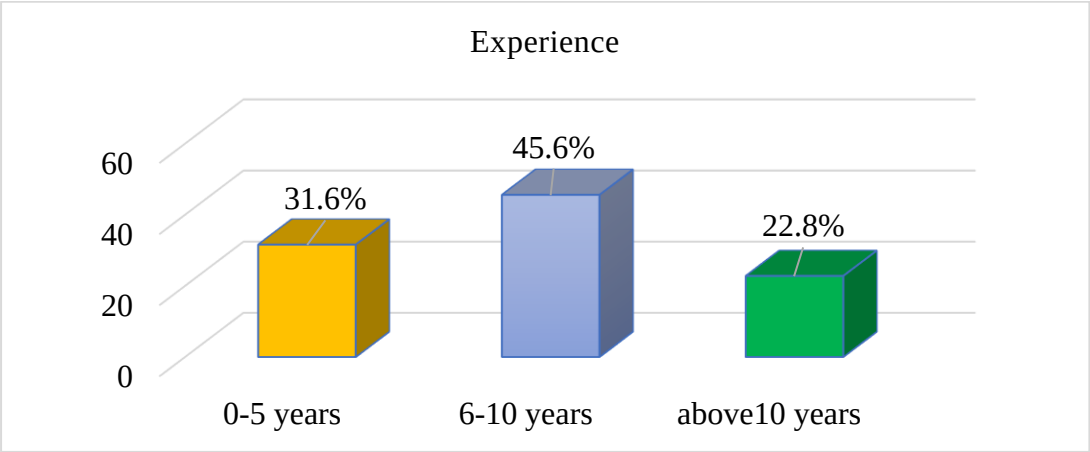

Figure 4.4: Respondents' Experience

The findings show that 45.6% had an experience of 6-10 years in the supermarkets, 31.6% had an experience of 0-5 years while 22.8% had an experience of above 10 years. The findings imply that the respondent's had vast experience in the supermarket and thus were assumed to have good knowledge on digital payments interoperability and revenue collection in the supermarkets.

4.4 Acceptability of Digital Payments Interoperability for Supermarkets

The study sought to determine the effect of acceptability of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya.

4.4.1 Descriptive Statistics for Acceptability of Digital Payments Interoperability

The descriptive statistics are presented in Table 4.6 with a view of understanding acceptability of digital payments interoperability.

Table 4.6: Acceptability of Digital Payments Interoperability for Supermarkets

Statement	N	Mean	Std. Dev
The ease of use of digital payments enhances acceptability of digital payments interoperability	79	3.99	0.63
The convenience in the use of digital payments enhance acceptability of digital payments interoperability	79	4.01	0.81
The security infrastructure in place in digital payments enhance acceptability of digital payments interoperability	79	3.90	0.52
The consistency of customer updates in regard to digital payments transactions enhance acceptability of digital payments interoperability	79	4.01	0.61
Encryption of customer information in regard to digital payments enhance acceptability of digital payments interoperability	79	4.01	0.81
Traceability of transactions of digital payments enhance acceptability of digital payments interoperability	79	4.04	0.61
The increased user knowledge on importance of use of digital payments enhances acceptability of digital payments interoperability	79	3.92	0.62

The majority of the respondents agreed that traceability of transactions of digital payments enhance acceptability of digital payments interoperability as shown by a mean of 4.04 and a standard deviation of 0.61. The mean was within the agree range of 3.4 to 4.2 and the standard deviation was below 1, depicting a low level of response variance. Most of the respondents agreed that the convenience in the use of digital payments enhance acceptability of digital payments interoperability as described by the mean score of 4.01

which falls within the agree range of 3.4 to 4.2 and a standard deviation of 0.81 which was less than 1, indicating a low level of response variance.

The respondents agreed that consistency of customer updates in regard to digital payments transactions enhance acceptability of digital payments interoperability as shown by a mean of 4.01 which falls within the agree range of 3.4 to 4.2 and a standard deviation of 0.61 depicting a low variance in responses. With a mean of 4.01 and a standard deviation of 0.81, the majority of the respondents agreed that encryption of customer information in regard to digital payments enhance acceptability of digital payments interoperability. Furthermore, the respondents agreed that the ease of use of digital payments enhances acceptability of digital payments interoperability as described by a mean of 3.99 which falls within the agree range of 3.4 to 4.2 and a standard deviation of 0.63 depicting a low variance in responses.

In addition, the respondents agreed that the increased user knowledge on importance of use of digital payments enhances acceptability of digital payments interoperability as illustrated by a mean of 3.92 which is within the agree range of 3.4 to 4.2. The response had a low standard deviation of 0.62 which is less than 1 depicting a low variance in responses. The respondents also agreed that the security infrastructure in place in digital payments enhance acceptability of digital payments interoperability as shown by a mean of 3.90 which is in the range of agree between 3.4 to 4.2. The response had a low standard deviation of 0.52 which is less than 1 depicting a low variance in responses.

4.4.2 Inferential Statistics of Acceptability of Digital Payments Interoperability

A simple linear regression analysis was conducted to assess the effect of acceptability of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya. The model summary is presented in Table 4.7.

Table 4.7: Model Summary of Acceptability of Digital Payments Interoperability

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.745[a]	.555	.523	.23697

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.187	1	5.187	21.3092	.003[b]
	Residual	18.743	77	0.243		
	Total	23.93	78			

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.588	0.318		4.994	0.000
	Acceptability	0.571	0.133	0.452	4.293	0.000

The regression model will be as follows.

$Y = 1.588 + 0.571X_1 + 0.318$

From the model, R which is the correlation coefficient showed that there existed a strong positive relationship between acceptability of digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya as indicated by the correlation coefficient of 0.745. The R-squared, also called the coefficient of determination, is the percent of the variance in the dependent variable explained uniquely or jointly by the independent variables. In this study, the model yielded an R-squared value of 0.555, indicating that 55.5% of the variations in the revenue collection for supermarkets in Nairobi, Kenya can be explained by acceptability of digital payments interoperability.

From the ANOVA, the study established that the regression model had a significance level of 0.003 which is an indication that the data was ideal for making a conclusion on the population parameters as the value of significance (p-value) was less than 5%. The calculated value was greater than the critical value (21.3092> 3.96) an indication that acceptability of digital payments interoperability had a significant effect on revenue collection for supermarkets in Nairobi. The significance value was less than 0.05 indicating that the model was significant.

From the regression model obtained above, a unit change in acceptability of digital payments interoperability while holding other factors constant would positively change revenue collection for supermarkets in Nairobi by a factor of 0.571. The p-value was 0.000, an indication that acceptability of digital payments interoperability had a significant influence on revenue collection for supermarkets in Nairobi at a 5% significance level. The study thus accepts the alternate hypothesis; *H_{a1}: Digital payments interoperability acceptability is positively related to revenue coll*4.5 Speed of Transactions of Digital Payments Interoperability for Supermarkets

4.5 Acceptability of Digital Payments Interoperability for Supermarkets

The study sought to determine the effect of speed of transactions of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya.

4.5.1 Descriptive Statistics for Speed of Transactions of Digital Payments Interoperability

Table 4.8: Speed of Transactions of Digital Payments Interoperability

Statement	N	Mean	Std. Dev
Our organization has invested in good technology infrastructure to enhance the speed of transactions of digital payments	79	4.10	0.50
Integration of various digital payments reduces the time taken to transact in supermarkets	79	3.96	0.44
Our organization has invested in quality information system to increase the speed of digital payments transactions regardless of the platform supporting it	79	3.91	0.46
Our organization regularly updates the information system to increase the speed of digital payments transactions across all interlinked payment platforms	79	3.87	0.46
The quality of the internet in our organization is good so as to increase the speed of digital payments transactions	79	3.80	0.67

Our organization has a quality Point of Sale card readers to enhance the speed of digital payments transactions	79	4.01	0.20
There are backups in regard to Point-of-Sale card readers to ensure continuity of digital payments in case the systems are down	79	4.08	0.62

The respondents agreed that their organization has invested in good technology infrastructure to enhance the speed of transactions of digital payments as shown by a mean score of 4.10 which is within the agree range of 3.5 to 4.2, and a standard deviation of 0.50 depicting a low variance in responses. The respondents agreed that there are backups in regard to Point-of-Sale card readers to ensure continuity of digital payments in case the systems are down as shown by a mean of 4.08 which is within the agree range of 3.4 to 4.2. The standard deviation was 0.62 depicting a low variance in responses. The respondents agreed that their organization has a quality Point of Sale card readers to enhance the speed of digital payments transactions as shown by a mean score of 4.01 and a standard deviation of 0.20 depicting a low variance in responses. Majority of the respondents agreed that integration of various digital payments reduces the time taken to transact in supermarkets as shown by a mean score of 0.44 which is within the agree range of 3.4 to 4.2 and a standard deviation of 0.4 depicting a low variance in responses.

The majority of the respondents agreed that their organization has invested in quality information system to increase the speed of digital payments transactions regardless of the platform supporting it as described by a mean of 3.91 and a standard deviation of 0.46. In addition, the respondents agreed that their organization regularly updates the information system to increase the speed of digital payments transactions across all interlinked payment platforms 3.87 which is within the agree range of 3.4 to 4.2. The standard deviation was 0.46 which is below 1 depicting a low variance in responses. The quality of the internet in the organization is good so as to increase the speed of digital payments transactions as indicated by a mean of 3.80 which is within the agree range of 3.4 to 4.2 and a standard deviation of 0.67 which is below 1 depicting a low variance in responses.

4.5.2 Inferential Statistics for Speed of Transactions of Digital Payments Interoperability

Table 4.9: Model Summary for Speed of Transactions of Digital Payments Interoperability

Model		R	R Square	Adjusted R Square	Std. Error of the Estimate	
1		.722[a]	.521	.485	.2939	
Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	.576	1	.576	5.312	.024[b]
	Residual	8.354	77	.108		
	Total	8.930	78			
Model		**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
		B	Std. Error	Beta		
1	(Constant)	2.071	0.518		3.998	0.001
	Speed of Transactions	0.476	0.116	0.401	4.103	0.001

$Y = 2.071 + 0.476X_2 + 0.518$

From the model, R which is the correlation coefficient showed that there existed a strong positive relationship between speed of transactions of digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya as indicated by the correlation coefficient of 0.722. The R-squared, also called the coefficient of determination, is the percent of the variance in the dependent variable explained uniquely or jointly by the independent variables. In this study, the model yielded an R-squared value of 0.521, indicating that 52.1% of the variations in the revenue collection for supermarkets in Nairobi, Kenya can be explained by speed of transactions of digital payments interoperability.

From the ANOVA, the study established that the regression model had a significance level of 0.024 which is an indication that the data was ideal for making a conclusion on the population parameters as the value of significance (p-value) was less than 5%. The calculated value was greater than the critical value (5.312> 3.96) an indication that speed of transactions of digital payments interoperability had a significant effect on revenue collection for supermarkets in Nairobi. The significance value was less than 0.05 indicating that the model was significant.

From the regression model obtained above, a unit change in speed of transactions of digital payments interoperability while holding other factors constant would positively change revenue collection for supermarkets in Nairobi by a factor of 0.476. The p-value was 0.001, an indication that speed of transactions of digital payments had a significant influence on revenue collection for supermarkets in Nairobi at a 5% significance level. The study thus accepts the alternate hypothesis H_{a2}*: Speed of transaction in digital payment interoperability is positively related to revenue collection.*

4.6 Traceability of Digital Payments Interoperability for Supermarkets

4.6.1 Descriptive Statistics of Traceability of Digital Payments Interoperability

Table 4.10: Traceability of Digital Payments Interoperability

Statement	N	Mean	Std. Dev
There are good internal control systems in place in our organization to ensure that digital payments are verified across all digital payment platforms	79	4.19	0.66
There are good internal control systems in place in our organization to ensure easier tracking of transactions from the integrated payment platforms	79	3.96	0.49
There are good internal control systems in place in our organization to ensure transparency of digital payments transactions	79	4.06	0.58
There is effective monitoring of digital payments transactions in our organization	79	4.18	0.62
The customer is always issued with a receipt in case of payment via card to ensure transparency of transactions in our organization	79	4.06	0.65
There is a hotline in our organization where customers can enquire about the digital payments, they have made in our organization	79	3.96	0.52

The majority of the respondents agreed that there are good internal control systems in place in the organization to ensure that digital payments are verified across all digital payment platforms as illustrated by a mean 4.19 which is within the agree range of 3.4 to 4.2 and a

standard deviation of 0.66 showing a low variance in responses. There is effective monitoring of digital payments transactions in our organization as illustrated by a mean of 4.18 which is within the agree range of 3.4 to 4.2 and a standard deviation of 0.62 showing a low variance in responses. The majority of the respondents agreed that there are good internal control systems in place in our organization to ensure transparency of digital payments transactions as illustrated by a mean of 4.06 which is within the agree range of 3.4 to 4.2 and a standard deviation of 0.58 showing a low variance in responses.

The respondent agreed that customer is always issued with a receipt in case of payment via card to ensure transparency of transactions in our organization as illustrated by a mean of 4.06 which is within the agree range of 3.4 to 4.2 and a low standard deviation of 0.65 showing a low variance in responses. The respondents further agreed that there are good internal control systems in place in our organization to ensure easier tracking of transactions from the integrated payment platforms as illustrated by a mean score of 3.962 and a standard deviation of 0.49 showing a low variance in responses since it is below 1. The majority of the respondents agreed there is a hotline in our organization where customers can enquire about the digital payments, they have made in our organization as illustrated by a mean score of 3.96 and a standard deviation of 0.52 showing a low variance in responses since it is below 1.

4.6.2 Inferential Statistics for Traceability of Digital Payments Interoperability

Table 4.11: Model Summary for Traceability of Digital Payments Interoperability

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	.629[a]	.396	.337	.3037

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression	4.162	1	4.162	13.3821	.004[b]
	Residual	23.948	77	0.311		
	Total	28.11	78			

Model		**Unstandardized Coefficients**		**Standardized Coefficients**		
		B	Std. Error	Beta	**t**	**Sig.**
1	(Constant)	2.874	0.577		4.981	0
	Traceability	0.468	0.116	0.442	4.034	0.003

$Y = 2.874 + 0.468X_3 + 0.577$

From the model, R which is the correlation coefficient showed that there existed a strong positive relationship between traceability of digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya as indicated by the correlation coefficient of 0.629. The R-squared, also called the coefficient of determination, is the percent of the variance in the dependent variable explained uniquely or jointly by the independent variables. In this study, the model yielded an R-squared value of 0.396, indicating that 39.6% of the variations in the revenue collection for supermarkets in Nairobi, Kenya can be explained by traceability of transactions of digital payments interoperability.

From the ANOVA, the study established that the regression model had a significance level of 0.004 which is an indication that the data was ideal for making a conclusion on the population parameters as the value of significance (p-value) was less than 5%. The calculated value was greater than the critical value (13.382> 3.96) an indication that traceability of transactions of digital payments interoperability had a significant effect on revenue collection for supermarkets in Nairobi. The significance value was less than 0.05 indicating that the model was significant.

From the regression model obtained above, a unit change in traceability of transactions of digital payments interoperability while holding other factors constant would positively change revenue collection for supermarkets in Nairobi by a factor of 0.468. The p-value was 0.003, an indication that traceability of transactions of digital payments had a significant influence on revenue collection for supermarkets in Nairobi at a 5% significance level. The study thus accepts the alternate hypothesis; *H_{a3}: Traceability in digital payment interoperability is positively related to revenue collection.*

4.7 Revenue Collection for Supermarkets

Table 4.12: Statements on Revenue Collection for Supermarkets

Statement	N	Mean	Std. Dev
The acceptability of integration of various digital payments platforms by our customers have enhanced revenue growth	79	3.94	0.65
There has been an increase in revenue in our organization over the last two years	79	3.76	0.72
There has been easier traceability of revenue flow in our organization over the last two years	79	3.73	0.65
We have been able to meet the revenue targets in our organization over the last two years	79	3.87	0.69
There has been reduced instances of theft as our organization has reduced the level of cash payments	79	4.05	0.71
The speed of transacting in our organization has enhanced revenue growth in our organization	79	4.09	0.58

The majority of the respondents agreed that the speed of transacting in their organization has enhanced revenue growth in their organization as demonstrated by a mean of 4.09 which is within the agree range of 3.4 to 4.2 and a standard deviation of 0.58 showing a low variance in responses. The respondents agreed that there has been reduced instances of theft as our organization has reduced the level of cash payments as shown by a mean of 4.05 which is within the agree range of 3.4 to 4.2 and a standard deviation of 0.71 showing a low variance in responses. Most of the respondents agreed that the acceptability of integration of various digital payments platforms by our customers have enhanced revenue growth as shown by a mean of 3.94 which is within the agree range of 3.4 to 4.2 and a standard deviation of 0.65 showing a low variance in responses.

In addition, the respondents agreed that they have been able to meet the revenue targets in our organization over the last two years as demonstrated by a mean of 3.87which is within the agree range of 3.4 to 4.2 and a standard deviation of 0.69 showing a low variance in responses. The respondents agreed that there has been an increase in revenue for our organization over the last two years as shown by a mean of 3.76, which is within the agree range of 3.4 to 4.2 and a standard deviation of 0.72 showing a low variance in responses. The majority of the respondents agreed that there has been easier traceability of revenue flow in our organization over the last two years as demonstrated by a mean of 3.73 which

is within the agree range of 3.4 to 4.2 and a standard deviation of 0.65 showing a low variance in responses.

4.8 Moderating Effect of Security on Digital Payments Interoperability and Revenue Collection

4.8.1 Descriptive Statistics of Security on Digital Payments Interoperability

Table 4.13: Statements on Security on Digital Payments Interoperability

Statement	N	Mean	Std. Dev
There are good internal control systems in place in our organization to ensure customers are secure when making digital payments transactions	79	4.16	0.63
There is proper authentication to enhance security of digital payment interoperability	79	3.85	0.70
The customers paying through cards are required to put their biometrics when making payments	79	4.06	0.65
We encourage our customers to use two-factor authentication when making digital payments to enhance security of their transactions	79	4.10	0.65
Our employees are well trained on latest security best practices to ensure customer's information is not prone to hackers	79	3.66	1.05
We ensure that we have employees with integrity so as to ensure that they don't disperse customer information to outsiders	79	3.94	0.49

The majority of the respondents agreed that there are good internal control systems in place in the organization to ensure customers are secure when making digital payments transactions as illustrated by a mean of 4.16 which is within the agree range of 3.4 to 4.2. The standard deviation was 0.63 showing a low variance in responses since it is below 1. The respondents agreed that they encourage their customers to use two-factor authentication when making digital payments to enhance security of their transactions as exemplified by a mean of 4.10 and a standard deviation of 0.65 showing a low variance in responses.

The respondents agreed that the customers paying through cards are required to put their biometrics when making payments as demonstrated by a mean of 4.06 which is within the agree range of 3.4 to 4.2 and a standard deviation of 0.65 showing a low variance in responses. Most of the respondents agreed that they ensure that we have employees with

integrity so as to ensure that they don't disperse customer information to outsiders as shown by a mean of 3.94 which is within the agree range of 3.4 to 4.2 and a standard deviation of 0.49 showing a low variance in responses.

The majority of the respondents also agreed that there is proper authentication to enhance security of digital payment interoperability as illustrated by a mean of 3.85 which is within the agree range of 3.4 to 4.2 which is within the agree range of 3.5 to 4.2 and a standard deviation of 0.70 showing a low variance in responses. The respondents also agreed that their employees are well trained on latest security best practices to ensure customer's information is not prone to hackers as demonstrated by a mean of 3.66 which is within the agree range of 3.4 to 4.2 and a standard deviation of 1.05 which is above 1 showing that the responses had a high variance.

4.8.2 Overall Inferential Statistics

The study fitted the first moderating model using financial performance as the revenue collection and the combined independent variables: acceptability, speed of transaction and traceability.

Table 4.14: Overall Model Summary

Model		**R**	**R Square**		**Adjusted R Square**	**Std. Error of the Estimate**	
1		.676[a]	.456		.450	.31576	
2		.792[b]	.628		.617	.26342	
Model			**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
1	Regression		17.851	3	5.950333	14.0670	.000[b]
	Residual		31.725	75	0.423		
	Total		49.576	78			
2	Regression		34.134	7	4.876286	17.2657	.000[c]
	Residual		20.0523	71	0.282		
	Total		54.1863	78			
Model			**Unstandardized Coefficients**		**Standardized Coefficients**	**t**	**Sig.**
			B	Std. Error	Beta		
1	(Constant)		3.909	.943		4.146	.001
	Acceptability		.354	.078	.314	4.569	.000
	Speed of transaction		.377	.065	.355	5.841	.000
	Traceability		0.367	0.081	0.344	4.531	.001
2	(Constant)		2.161	0.433		4.991	.000
	Acceptability		0.44	0.101	0.402	4.356	.000
	Speed of transaction		0.42	0.099	0.382	4.242	.000
	Traceability		0.37	0.084	0.345	4.405	.001
	Security		0.56	0.136	0.471	4.118	.004

The first overall regression model will be as follows.

$Y = 3.909+ 0.\ 354X_1 + 0.\ 377X_2 + 0.367X_3 + 0.943$

The overall regression model will be as follows.

$Y = 2.161+ 0.44X_1 + 0.42X_2 + 0.37X_3 + 0.56X_4 + 0.433$

The R-squared value for the association between these four predictor variables and the dependent variable was 0.456. This means that the three independent variables explain 45.6 percent of the change in revenue collection for supermarkets in Nairobi, Kenya.

The second step comprised of the three independent variables (acceptability, speed of transaction and traceability), the moderator(security), and the interactions between all the independent variables and the moderator(security). The R-squared was 0.628 which implies that 62.8% of the revenue collection for supermarkets in Nairobi, Kenya is explained by the stated variables. The results show that the introduction of security in the second model led to a 17.2% increase in R-squared.

From the findings, as presented in Table 4.14, the first model's F-calculated was 14.067, whereas the second model's F-calculated was 17.2657. The F-calculated for the two models was higher than the F-critical (2.727) for the first model and (2.142) for the second model, indicating that the two models were a good fit for the data. As a result, the two models may be used to forecast the moderating effect of security on the relationship between digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya.

The researcher investigated the significance of the moderating effect of security on the relationship between digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya. The combined influence of the three independent variables was investigated in the first model. The findings show that the acceptability has a positive and statistically significant influence on revenue collection for supermarkets in Nairobi, Kenya as shown by a coefficient of 0.355 and p-value of 0.000.

Speed of transaction has a positive and statistically significant influence on revenue collection for supermarkets in Nairobi, Kenya as shown by a coefficient of 0.377 and p-value of 0.000. Traceability has a positive and statistically significant influence on revenue collection for supermarkets in Nairobi, Kenya as shown by a coefficient of 0.367 and p-value of 0.000.

In the second model, acceptability, speed of transaction and traceability were statistically significant predictors of revenue collection for supermarkets in Nairobi, Kenya. The findings further reveal that security had a statistically significant moderating effect on acceptability of digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya as shown by a coefficient of 0.535 and p value =0.000. Security had a statistically significant moderating effect on speed of transaction of digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya as shown by a coefficient of 0.438 and p value =0.000. Security had a statistically significant moderating effect on traceability of digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya as shown by a coefficient of 0.461 and p value =0.001. The study thus accepts the alternate hypothesis; *Ha4: The moderating effect of Security on Digital payment interoperability has a positive effect on revenue collection.*

4.8 Chapter Summary

The chapter presents the analysis of the research findings based on the field data. Both descriptive and inferential statistics for each variable have been presented in the chapter. The findings from the chapter have shown that acceptability, speed of transaction, traceability positively affect the revenue collection for supermarkets in Nairobi, Kenya.

CHAPTER FIVE

DISCUSSIONS, CONCLUSION, AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the discussion, conclusion and recommendations. In the discussion, the researcher interprets and explains the study's results, drawing connections to the research questions or hypotheses. The conclusion section summarizes the key findings of the study and provides a final assessment of the research hypotheses. The recommendation section offers suggestions for practical and managerial applications of the study's findings. The chapter also presents the limitations of the study and suggestions for further research.

5.2 Discussion of Findings

5.2.1 Acceptability of Digital Payments Interoperability and Revenue Collection

The study revealed that traceability of transactions of digital payments enhance acceptability of digital payments interoperability. The findings differed from Temba (2018) who revealed that majority of traders seem to dislike the idea of using digital systems due to long time taken to process one transaction, difficulty in getting maintenance in case traders encounter any problem, high price as well as unreliable network that hinders effectiveness in undertaking transactions. The findings further found that convenience in the use of digital payments enhances acceptability of digital payments interoperability. Consistency of customer updates in regard to digital payments transactions enhance acceptability of digital payments interoperability. Encryption of customer information in regard to digital payments enhances acceptability of digital payments interoperability. The ease of use of digital payments enhances acceptability of digital payments interoperability.

The study further found that the increased user knowledge on importance of use of digital payments enhance acceptability of digital payments interoperability. Similarly, Okiro (2015) supported the idea that there should be awareness campaigns to ensure that the consumers get the right information as pertains to e-payment revenue collection. The security infrastructure in place in digital payments enhances acceptability of digital payments interoperability. The findings concur with the observations by Fatonah et al., (2018) that failure to incorporate proper usability, security, and efficiency in system design results in complete rejection of the software product.

5.2.2 Speed of Transactions, of Digital Payments Interoperability and Revenue Collection

The study established that the speed of transactions of digital payments had a significant influence on revenue collection for supermarkets in Nairobi. The findings agree with the sentiments by Tan et al., (2019) that digital payment services make funds available within a few days. The organizations have invested in good technology infrastructure to enhance the speed of transactions of digital payments. There are backups in regard to Point-of-Sale card readers to ensure continuity of digital payments in case the systems are down. From the findings, the organizations have quality Point of Sale card readers to enhance the speed of digital payments transactions. The integration of various digital payments reduces the time taken to transact in supermarkets.

It was evident that the quality of the internet in the organizations is good so as to increase the speed of digital payments transactions. Inconsistent with the findings, Grace (2022) found that the relationship between electronic payment systems and revenue collection in Uganda was limited by network inconsistencies. The study found that the organizations have invested in quality information systems to increase the speed of digital payments transactions regardless of the platforms supporting it. Moreover, the organizations regularly update the information systems to increase the speed of digital payments transactions across all interlinked payment platforms. Corroborating with the findings, Kumar & Chaubey, 2017) support that digital payment offers intuitive platforms that easily integrate with all existing systems.

5.2.3 Traceability of Digital Payments Interoperability and Revenue Collection

The study found that traceability of transactions of digital payments had a significant influence on revenue collection for supermarkets in Nairobi. There are good internal control systems in place in the organizations to ensure that digital payments are verified across all digital payment platforms. Consistent with the findings, Mtebe and Sausi (2021) the revolutionization of revenue collection with government e-payment gateway system enhanced the trust between citizens and government, increased transparency, and traceability in the process of revenue collection. The findings revealed that there is effective monitoring of digital payments transactions in the organizations. It was found there are

good internal control systems in place in the organization to ensure transparency of digital payments transactions.

Customers are always issued with a receipt in case of payment via card to ensure transparency of transactions in the organizations. In addition, there are good internal control systems in place in the organizations to ensure easier tracking of transactions from the integrated payment platforms. There is a hotline in the organizations where customers can enquire about the digital payments they have made in the organizations. The findings were consistent with the findings by Yaqub et al. (2022) who assessed the role of web-design, e-payment, and e-traceability in developing customer satisfaction with the mediating role of consumer behavior and found that there is a significant role of e-traceability in developing customer satisfaction with the mediating role of consumer behavior which enhance revenue growth.

5.2.4 Moderating Effect of Security on Digital Payments Interoperability and Revenue Collection

The study established that security had a statistically significant moderating effect on digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya. The study found that there are good internal control systems in place in the organizations to ensure customers are secure when making digital payments transactions. Similarly, Mwasaru (2020) found that the relationship between platform security and revenue collection has a significant effect on revenue collection.

The firms encourage their customers to use two-factor authentication when making digital payments to enhance security of their transactions. Furthermore, the customers paying through cards are required to put their biometrics when making payments. The firms ensure that they have employees with integrity so as to ensure that they don't disperse customer information to outsiders. It was also found that there is proper authentication to enhance security of digital payment interoperability. The employees are well trained in the latest security best practices to ensure customer's information is not prone to hackers. Inconsistent with the findings, Kishura (2020) found that, the GePG, as a system of managing public finance has been experiencing system security attack, lack of information sharing between institutions and the problem from other institutions.

5.3 Conclusions

The study sought to determine the effect of acceptability of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya. The study found that acceptability of digital payments interoperability had a significant effect on revenue collection for supermarkets in Nairobi. The study thus concludes that acceptability of digital payments interoperability had a significant positive effect on revenue collection for supermarkets in Nairobi, Kenya.

The study sought to investigate the effect of speed of transactions, of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya. The study found that speed of transactions of digital payments interoperability had a significant effect on revenue collection for supermarkets in Nairobi. The study thus concludes that speed of transactions of digital payments interoperability had a significant positive effect on revenue collection for supermarkets in Nairobi, Kenya.

The study sought to determine the effect of traceability of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya. The study found that traceability of digital payments interoperability had a significant effect on revenue collection for supermarkets in Nairobi. The study thus concludes that traceability of digital payments interoperability had a significant positive effect on revenue collection for supermarkets in Nairobi, Kenya.

The study also sought to investigate the moderating effect of security on digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya. The findings reveal that security had a statistically significant moderating effect on acceptability, speed of transactions and traceability and revenue collection for supermarkets in Nairobi, Kenya. Thus, security has a significant moderating effect on digital payments interoperability and revenue collection for supermarkets in Nairobi, Kenya.

5.4 Recommendations

5.4.1 Policy Recommendations

To ensure security and privacy policymakers should ensure that digital payment systems are secure and protect customer data. Regulations can be implemented to enforce data

privacy and security standards for digital payment systems. This can help to build trust with customers and encourage the adoption of digital payments.

Governments can encourage innovation in digital payment systems by providing funding for research and development, as well as offering tax incentives to businesses that develop innovative digital payment solutions. This will also enhance visibility for the government on Taxes due.

Governments can support the development of digital infrastructure, such as mobile networks and broadband internet, that is necessary for digital payments to be widely adopted. This can include investing in infrastructure development, subsidizing access to digital networks, and incentivizing private investment in digital infrastructure.

5.4.2 Managerial Recommendations

The study recommends that firms can encourage the development of interoperable digital payment systems that can work across different platforms and devices. This can help to reduce barriers to adoption and increase the convenience of digital payments for customers thus increasing revenue collection.

The study recommends that, to further encourage adoption of digital payments, the supermarkets can provide incentives to customers, working jointly with platform providers such as VISA, Safaricom, Airtel, Telcom, Banks amongst others. For example, customers can be offered discounts or rewards for using digital payments.

The supermarkets can also work to educate consumers about the benefits and risks of using digital payment systems. This can include providing information on how to use digital payment systems safely and securely, as well as educating consumers on their rights and protections when using these systems.

The study recommends full adoption of Digital Payment Interoperability as a driver of innovation to improve business performance through emerging technology.

5.4.3 Theoretical Contributions

The findings of the study contribute to the Technology Acceptance Theory. The findings revealed that the ease of use of digital payments enhances acceptability of digital payments interoperability which concurs with the Technology Acceptance Theory as it explains how users perceive and adopt new technology. Technology Acceptance Theory identifies two

primary factors that determine a user's acceptance of new technology: perceived usefulness and perceived ease of use. The study contributes to the transaction cost theory in several ways. Transaction cost theory explains how the cost of conducting a transaction can affect the behavior of economic agents. The theory suggests that minimizing transaction costs can lead to increased efficiency and welfare. With digital payment systems, customers do not need to carry cash or search for the correct change. This reduces the time and effort required to conduct a transaction, leading to a reduction in search costs. Digital payment systems reduce the information costs associated with a transaction. For example, digital payment systems can provide real-time information about the availability of funds in a customer's account. With digital payment systems, the risk of fraud and theft is reduced through proper authentication such as two factor authentication, which can be costly for both customers and retailers. By reducing these costs, digital payment systems can lead to increased efficiency and welfare, consistent with the predictions of transaction cost theory.

5.5 Limitations of the Study and Suggestions for Further Research

The study anticipated that the respondents targeted in this study may have been reluctant in giving information due to data privacy and sensitivity of the information being sought, especially on revenue collections. The researcher handled this by carrying an introduction letter from the University to assure the respondents that the information they give would be treated with confidentiality and be used purely for academic purposes. The study was also limited to primary data. The findings reveal that acceptability, speed of transactions and traceability were significant predictors of revenue collection for supermarkets in Nairobi, Kenya.

5.6 Implication of the Study

The study focused on the effect of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya, future studies should focus on other sectors of the economy and compare the results with supermarkets. Further, the researcher recommends that future studies should utilize secondary data which could reveal the amount of revenue collected through the digital payments verses the cost of running the service (digital payment interoperability) that is, infrastructure and application costs and hence question if it is a viable innovation. It was noted from the R squared that 62.8% of the revenue in supermarkets considered was influenced by digital payments interoperability. Future studies should focus on other factors that have an influence on revenue collection for

supermarkets apart from digital payments interoperability such as marketing, employee service quality and quality of products.

The current study did not capture how digital payment interoperability is shaping e-commerce in the retail and supermarket space and hence this is recommended as an area of future study, where customers are able to buy items online or from the comfort of their homes. The implications of the same on supermarket's performance in terms of revenue growth, reach (customer base) and resilience to the macro-economic factors affecting businesses.

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APPENDICES

Appendix I: List of Supermarkets with Their Branches

	List of Member Supermarkets with Presence in Nairobi	Any other town with presence	Head Office	No. of Branches
1.	Budget Supermarkets	Wangúru Mwea Town, Mombasa	Off Kamiti Road, near Co-Op Bank, Nairobi	7
2.	Builders Warehouse	South Africa, Johannesburg	Waterfront Karen, Nairobi	1
3.	Chandarana	Kakameg, Ukunda, Nyali	3rd Floor of the Lenana Place Building, at 197 Lenana Road, Nairobi	24
4.	Cleanself Supermarkets	Kiambu, Ongata Rongai	Lusaka Rd, ACL Godowns, Nairobi	12
5.	County Supermarkets Ltd	Murang'a Kenol	Kenol, Murangá Town	
6.	Eastmatt Supermarkets	Tala, Mwea	Mau Narok, Nakuru County	9
7.	Gilanis Supermarket	Nakuru, Kisumu	Gilanis, Ground Floor, Club Rd CBD, Nakuru	8
8.	Khetias	Eldoret, Busia	Kitale Town of Trans – Nzoia County along Mumia highway	6
9.	Magunas	Kirinyaga, Murang'a, Embu	Rukanga, Kenya, Kirinyaga County	16
10.	Majid Al Futtaim Hypermarket (Carrefour)	Kisumu, Mombasa, Nakuru	Two Rivers Mall Nairobi	16
11.	Mathai Supermarkets	Embu, Karatina, Nyeri, Meru	Thika Town, along Mama Ngina Drive	8
12.	Naivas Supermarkets	Nakuru, Mombasa, Kisumu	Sameer Business Park, in the Industrial Area of Nairobi	84
13.	Powerstar	Nairobi, Kikuyu	Namanga road, Kitengela	6
14.	Onn the Way	Mavoko - Machakos	Limuru Road, Nairobi	4
15.	Quickmart Ltd	Naivasha, Kikuyu	Village Market, Nairobi	51
16.	Safeway Hypermarket	Nairobi	HURLINGHAM COURT BUILDING ARGWINGS KODHEK ROAD Rd	2

17.	Tumaini Self Service Ltd	Kisumu	Pipeline, Off Outer Ring Road, Embakasi, Nairobi,	13
	Muhindi Mweusi Supermarkets	Nairobi	Nairobi, Kenya. Embakasi South Ward	4

Source: Retail Trade Association of Kenya Report (2021)

Appendix II: Letter of Introduction

Ole Sangale Rd, Madaraka Estate,
P.O Box 59857 00200, Nairobi, Kenya.
Cell: +254 703 414/6/7, Twitter: @SBSKenya
Email: info@sbs.ac.ke or vist **www.sbs.strathmore.edu**

Strathmore UNIVERSITY BUSINESS SCHOOL

27th February 2023

To Whom It May Concern,

RE: FACILITATION OF RESEARCH – PETER OYAMO.

This is to introduce Peter Oyamo who is a Master of Commerce (MCOM) Student at Strathmore University Business School, admission number MCOM/14436. As part of our MCOM Programme, Peter is expected to do applied research and undertake a project. This is in partial fulfilment of the requirements of the MCOM course. To this effect, Peter would like to request appropriate data from your organization.

Peter is undertaking a research paper on "**EFFECT OF DIGITAL PAYMENTS INTEROPERABILITY ON REVENUE COLLECTION FOR SUPERMARKETS IN NAIROBI, KENYA.**" The information obtained shall be treated confidentially and shall be used for academic purposes only.

Our MCOM Programme 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 our 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 shall be willing to provide any further information if required.

Yours sincerely,

Njoki Kiagiri
Manager – Graduate Programmes
Strathmore University Business School.

Appendix III: Questionnaire

Section A: Demographic Information

Please select the correct answer.

1. Please indicate your gender. [ ] Male [ ] Female
2. Please identify the range of your age in years. 20-30 [ ] 31-40 [ ]

   41-50 [ ] Above 51 [ ]
3. What's your highest Education level?

   Diploma [ ] Bachelor's Degree [ ] Postgraduate [ ]
4. What is your experience in terms of the number of years working in supermarket/s?

   0-5 [ ] 6-10 [ ] Above 10 [ ]

Section B: Acceptability of Digital Payments

5. What's your agreement when it comes to statements that relate to the effect of acceptability of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya?

Where Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5)

Statement	**1**	**2**	**3**	**4**	**5**
The ease of use of digital payments enhances acceptability of digital payments interoperability					
The convenience in the use of digital payments enhance acceptability of digital payments interoperability					
The security infrastructure in place in digital payments enhance acceptability of digital payments interoperability					
The consistency of customer updates in regard to digital payments transactions enhance acceptability of digital payments interoperability					

Encryption of customer information in regard to digital payments enhance acceptability of digital payments interoperability					
Traceability of transactions of digital payments enhance acceptability of digital payments interoperability					
The increased user knowledge on importance of use of digital payments enhances acceptability of digital payments interoperability					

Section C: Speed of Transactions of Digital Payments

6. What's your agreement when it comes to statements that relate to the effect of speed of transactions of inter-operator digital payments on revenue collection for merchants in form of supermarkets in Nairobi, Kenya?

Where Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5)

Statement	**1**	**2**	**3**	**4**	**5**
Our organization has invested in good technology infrastructure to enhance the speed of transactions of digital payments					
Integration of various digital payments reduces the time taken to transact in supermarkets					
Our organization has invested in quality information system to increase the speed of digital payments transactions regardless of the platform supporting it					
Our organization regularly updates the information system to increase the speed of digital payments transactions across all interlinked payment platforms					
The quality of the internet in our organization is good so as to increase the speed of digital payments transactions					
Our organization has a quality Point of Sale card readers to enhance the speed of digital payments transactions					

There are backups in regard to Point-of-Sale card readers to ensure continuity of digital payments in case the systems are down					

Section D: Traceability of Digital Payments

7. What's your agreement when it comes to statements that relate to the effect of traceability of digital payments on revenue collection for supermarkets in Nairobi, Kenya?

Where Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5)

Statement	**1**	**2**	**3**	**4**	**5**
There are good internal control systems in place in our organization to ensure that digital payments are verified across all digital payment platforms					
There are good internal control systems in place in our organization to ensure easier tracking of transactions from the integrated payment platforms					
There are good internal control systems in place in our organization to ensure transparency of digital payments transactions					
There is effective monitoring of digital payments transactions in our organization					
The customer is always issued with a receipt in case of payment via card to ensure transparency of transactions in our organization					
There is a hotline in our organization where customers can enquire about the digital payments, they have made in our organization					

Section E: Security of Digital Payments

8. What's your agreement when it comes to statements that relate to the effect of security of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya?

Where Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5)

Statement	**1**	**2**	**3**	**4**	**5**
There are good internal control systems in place in our organization to ensure customers are secure when making digital payments transactions					
There is proper authentication to enhance security of digital payment interoperability					
The customers paying through cards are required to put their biometrics when making payments					
We encourage our customers to use two-factor authentication when making digital payments to enhance security of their transactions					
Our employees are well trained on latest security best practices to ensure customer's information is not prone to hackers					
We ensure that we have employees with integrity so as to ensure that they don't disperse customer information to outsiders					

Section F: Revenue collection

9. What's your agreement when it comes to statements that relate to the effect of digital payments interoperability on revenue collection for supermarkets in Nairobi, Kenya?

Where Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4) and Strongly Agree (5)

Statement	**1**	**2**	**3**	**4**	**5**
The acceptability of integration of various digital payments platforms by our customers have enhanced revenue growth					
There has been an increase in revenue in our organization over the last two years					
There has been easier traceability of revenue flow in our organization over the last two years					
We have been able to meet the revenue targets in our organization over the last two years					
There has been reduced instances of theft as our organization has reduced the level of cash payments					
The speed of transacting in our organization has enhanced revenue growth in our organization					

Thanks for your cooperation.

Source: Researcher (2023)

Appendix IV: Ethical Approval

Strathmore UNIVERSITY

24th March 2023

Mr Owino Peter Oyamo,
p.oyamo555@gmail.com

Dear Mr Owino,

RE: Effect of Digital Payments Interoperability on Revenue Collection for Supermarkets in Nairobi, 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-ISERC1633/23.** The approval period is from **24th March 2023 to 23rd March 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)
24-Mar-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
Email admissions@strathmore.edu www.strathmore.edu

Appendix V: Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **372245**

Date of Issue: **05/April/2023**

RESEARCH LICENSE

This is to Certify that Mr.. PETER OWINO OYAMO 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: EFFECT OF DIGITAL PAYMENTS INTEROPERABILITY ON REVENUE COLLECTION FOR SUPERMARKETS IN NAIROBI, KENYA for the period ending : 05/April/2024.

License No: **NACOSTI/P/23/24875**

372245

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

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THE SCIENCE, TECHNOLOGY AND INNOVATION ACT, 2013 (Rev. 2014)

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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
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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
E-mail: dg@nacosti.go.ke
Website: www.nacosti.go.ke