

**A DISRUPTIVE ICT INNOVATION MODEL AND REFERENCE  
ARCHITECTURE FOR DEVELOPING ECONOMIES: A CASE STUDY OF  
KENYA**

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**A THESIS REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE  
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PHILOSOPHY IN INFORMATION TECHNOLOGY OF MASINDE MULIRO  
UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**JULY 2025**

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## CERTIFICATION

This thesis report has been submitted for examination with our approval as the university's supervisors.

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## **DEDICATION**

This research is dedicated to my grandfather and friend, the late James Tergech (miten ngetiet)

## **ACKNOWLEDGEMENT**

First, I wish to thank The Almighty God for strengthening me and granting me sufficient grace to complete this thesis.

I also wish to acknowledge my committed supervisors Prof. Kelvin Omieno and Dr. Jasper Ondulo for their selfless guidance in the development of this thesis; their inspiration, motivation, positive criticism and professional guidance which was vital in shaping this research.

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## ABSTRACT

Information Technology innovations are evolving very fast. Understanding the process by which innovations in this sector are taking place is of central importance for the future development and sustainability of the ICT sector and for businesses to position ICT as a critical element in their competitiveness. While several theories have been developed to explain the trajectory of disruptive innovations, there are concerns among the research community that the evolution of the mobile banking in Kenya has opened a lid on why theories of disruptive innovations developed for the developed economies may not well fit in the African and other developing nations scenario. This has partly been because of the different characteristics of ICT demands in these economies. This study therefore aimed at determining the factors that influence the success of an ICT innovation by; assessing the effects of disruptive ICTs in the Kenyan economy; determining through the lens of a theoretical model the factors that influence the success of disruptive ICT innovations and thereby develop a model for adoption of disruptive innovations in developing economies. To achieve these objectives, the study purposed to focus on the Kenya's three main metropolitan cities; notably the capital city of Nairobi, Mombasa and Kisumu Cities. The research design for the study was a mixed method using both qualitative and quantitative data. Qualitatively, 20 ICT experts/leaders, drawn from the government and top telecommunications industry, were purposively identified. For quantitative design, the questionnaires were shared through snowballing effect to the key informants, which led to a sample of 81 respondents returning their feedback; drawn from the private sector specifically, firms that were considered to have developed ICTs that were considered to have some element of disruptiveness. Data analysis was done using R and the results presented descriptively and inferentially using both graphics and equations. The study makes an original contribution by developing a context-specific model for disruptive ICT adoption and translating it into a reference architecture that guides policymakers and industry practitioners. The architecture provides a structured framework for facilitating sustainable ICT innovation in resource-constrained contexts. The study identified external factors, Market forces, implementation environment, social factors and technological features as key determinants of the success of ICT innovations. The constructs from the conceptual framework formed the basis of the developed disruptive ICT innovation model. The study findings are critical in assessing the disruptive potential/patterns of ICT innovations in the developing economies. Key recommendations include strengthening institutional policies to support digital transformation, improving interoperability among ICT platforms, and enhancing financial incentives for innovation adoption. The findings have theoretical, practical, and policy implications for the advancement of ICT innovation in developing economies.

**Keywords:** Innovation, disruptive innovation, model, ICT innovation, competitiveness.

## **TABLE OF CONTENTS**

<b>PLAGIARISM STATEMENT .....</b>	<b>2</b>
<b>DECLARATION .....</b>	<b>3</b>
<b>DEDICATION .....</b>	<b>4</b>
<b>ACKNOWLEDGEMENT .....</b>	<b>5</b>
<b>ABSTRACT .....</b>	<b>6</b>
<b>LIST OF FIGURES.....</b>	<b>17</b>
<b>LIST OF TABLES.....</b>	<b>18</b>
<b>LIST OF ABBREVIATIONS AND ACRONYMS.....</b>	<b>19</b>
<b>CHAPTER ONE: INTRODUCTION.....</b>	<b>20</b>
1.1 Background to the study .....	20
1.1.1 Disruptive Innovations .....	22
1.1.2 Disruptive ICT .....	24
1.1.3 The Banking industry .....	25
1.1.4 Disruptive innovations in Kenya’s Banking sector .....	26
1.1.4.1 Online banking .....	26
1.1.4.2 Mobile Money: .....	27
1.1.4.3 Digital Lending:.....	28
1.1.3 A case of Kenya post and Telecommunication Corporation (KP&TC)...	29
1.2 Statement of the problem.....	32
1.3 Objectives of the study .....	32
1.3.1 General objective.....	32

1.3.2 Specific objectives .....	33
1.4 Research questions .....	33
1.5 Justification of the study.....	33
1.6 Significance of the study .....	35
1.7 Scope of the study .....	35
1.8 Limitations of the study.....	36
1.9 Assumptions of the Study.....	36
1.10 Structure of the thesis .....	37
<b>CHAPTER TWO: LITERATURE REVIEW .....</b>	<b>39</b>
2.2 Theoretical literature .....	39
2.2.1 Theory of disruptive innovations.....	39
2.2.2 Disruptive Innovation principles .....	43
2.2.2 The Technology Acceptance Model (TAM) .....	44
2.2.2.1 Application of TAM in digital innovations .....	47
2.2.3 Theory of reasoned action (TRA).....	49
2.2.3.1 Theory of reasoned action and disruptive innovations .....	51
2.2.4 The Extended Technology Acceptance Model (TAM2) .....	52
2.2.5 The Unified Theory of Acceptance and Use of Technology (UTAUT) ..	54
2.2.5.1 UTUAT and technology acceptance .....	56
2.4 Nature of innovation.....	58
2.4.1 Radical innovation.....	60
2.4.2 Incremental innovations .....	61
2.4.3 Discontinuous innovation.....	63
2.4.4 Architectural Innovation.....	66
2.4.5 Modular Innovation .....	66
2.5 Emerging disruptive innovations.....	70
2.5.1 Cell phones .....	70

2.5.2 Mobile Banking .....	71
2.5.3 Cloud Technology .....	71
2.5.4 Autonomous Vehicles .....	72
2.5.5 Mobile Internet .....	73
2.5.6 Advanced Robotics.....	73
2.5.7 Knowledge work Automation .....	74
2.6 Existing innovation models .....	75
2.6.1 Model for disruptive innovation.....	75
2.6.2 The Innovator’s dilemma .....	78
2.6.3 Proposed Disruptive Innovation Model.....	81
2.7 Business model innovations and radical product innovations.....	83
2.7.1 Business model innovation.....	83
2.7.2 Radical Product Innovations.....	85
2.8 Factors influencing the success of ICT innovations.....	86
2.8.1 ICT innovation architecture.....	88
2.8.2 Legal and regulatory models .....	89
2.8.3 Implementation environment.....	91
2.8.4 Market structure.....	92
2.8.5 Organizational ICT Values.....	96
2.8.6 Financial Investments.....	98
2.8.7 Organizational Processes.....	100
2.9 Conceptual Model .....	103
2.10 Factors influencing the success of ICT innovations in Kenya .....	104
2.11 Summary.....	106
2.12 Gaps in literature review .....	108
<b>CHAPTER THREE: RESEARCH METHODOLOGY .....</b>	<b>110</b>

3.0.1 OVERVIEW .....	110
3.1 Research Design .....	110
3.2 Research Philosophy .....	112
3.3 Research Approach.....	113
3.4 Research Strategy and Time Horizons .....	113
3.6 Choice of study area .....	116
3.7 Target population.....	117
3.7.1 Sample size inclusion and exclusion criteria.....	118
3.7.2.1 Inclusion Criteria.....	119
3.5.2.2 Exclusion Criteria .....	119
3.8 Sample size .....	120
3.9 Data collection Instruments .....	121
3.9.1 Questionnaires .....	122
3.9.2 Interviews .....	124
3.10 Validity & Reliability .....	124
3.10.1 Validity .....	124
3.10.2 Reliability .....	125
3.11 Data collection procedures .....	130
3.12 Data analysis and presentation .....	130
3.12.1 Analysis of quantitative data .....	130
3.12.2 Analysis of qualitative data .....	131
3.13 Ethical Considerations .....	131
<b>CHAPTER FOUR: DATA ANALYSIS AND PRESENTATION .....</b>	<b>132</b>
4.0 Overview of the Chapter .....	132
4.1 Demographic Factors.....	133
4.1.2 Distribution by age .....	133
4.1.3 Level of Education .....	134

4.1.4 Level of Skills in Computing .....	135
4.1.5 Years of Experience .....	136
4.2 Innovation Structure .....	138
4.2.1 Technology sophistication affects the rate at which an ICT innovation is accepted .....	138
4.2.2 Cost of a given Technology Influences its Acceptability.....	139
4.2.3 The cost of related hardware and software is critical to the acceptability of a given ICT .....	140
4.2.4 Knowledge and skills in the user environment affect how it is accepted .....	140
4.2.5 ICT innovation architecture affects the performance of an innovation..	142
4.3 ICT Implementation Environment .....	143
4.3.1 User sophistication affects the rate at which an ICT innovation is accepted .....	143
4.3.2 Acceptability of a given innovation affects its diffusion.....	144
4.3.3 Perception of an ICT innovation influences its adoption by users.....	145
4.3.4 ICT innovation environment affects the success of an innovation.....	146
4.4 Market Structure .....	147
4.4.1 The perception of a technology in the market determines its success in the market .....	147
4.4.2 Existing related technologies affect the adoptability of a given innovation .....	148
4.4.3 The cost of alternative technologies determines the success of a given innovation .....	149
4.4.4 The presence of target market influences the success of a given innovation .....	150
4.4.5 Market Structure affects the success of an innovation .....	151
4.5 Government Regulations .....	152

4.5.1 Government regulations influence the performance of ICT innovations .....	153
4.5.2 The government ICT policies and regulations in place support the growth of ICT innovations.....	154
4.5.3 Taxation measures are supportive of the developments in ICT .....	154
4.5.4 There are no legal issues that hamper the growth of ICT innovations ...	155
4.6 Organizational ICT values.....	156
4.6.1 The organization has clear ICT values .....	156
4.6.2 The organization has an ICT policy available to all its staff.....	157
4.6.3 The organization encourages innovations from its ICT staff.....	158
4.6.4 ICT personnel are rewarded for their innovative idea.....	159
4.6.5 Organizational ICT values influence the performance of an innovation	160
4.7 Financial investment in ICT innovations. ....	161
4.7.1 Financial investment on an ICT innovation determines its Success in the market.....	161
4.7.2 There is no direct relationship between an ICT innovation and financial investment.....	162
4.7.3 Financial investment is the biggest determinant of the success of an ICT innovation.....	163
4.7.4 Innovations that have been adequately funded by the organization have been successful .....	164
4.7.5 There is a clear channel for funding of ICT innovations in the organization .....	165
4.8.1 Organizational processes impact the success of an ICT innovation.....	166
4.8.2 Inherent organizational processes make it easier to implement ICT innovations .....	167
4.8.3 The organization has clear processes for all its functions. ....	168
4.8.4 The organization has clear processes for all its functions .....	169
4.9 Regression Analysis .....	170

4.9.1 High level Model summary .....	171
4.10 Disruptive ICT model design .....	173
4.10.1 Proposed model measurement model .....	174
4.10.2 Model constructs .....	175
4.10.1.1 Technological features .....	175
4.1.1.2 Market forces .....	176
4.1.1.3 Social factors .....	177
4.1.1.4 External factors .....	177
4.10.3 Proposed disruptive ICT model .....	179
4.12 Model constructs identification .....	179
4.13 Summary .....	180

## **CHAPTER FIVE: PROPOSED DISRUPTIVE ICT INNOVATION**

### **ARCHITECTURE ..... 181**

5.1 Introduction .....	181
5.2 Proposed Architecture.....	181
5.3 Innovation architecture .....	182
5.3.1 User Interface Design .....	182
5.3.2 Accessibility .....	183
5.3.3 Intuitiveness.....	184
5.3.4 Integration.....	185
5.3.5 Compatibility with Existing Systems .....	185
5.3.6 Interoperability .....	186
5.3.7 Seamless Integration into Workflows .....	186
5.3.8 Maturity .....	187
5.3.9 Stability.....	187
5.3.10 Reliability .....	187
5.3.11 Scalability .....	188

5.3.12 Diffusion.....	188
5.3.13 Reach and Penetration .....	189
5.3.14 Network Effects.....	189
5.3.15 Virality and Word-of-Mouth .....	190
5.4 Market Dynamics .....	190
5.4.1 Target Market Identification: .....	191
5.4.2 Value Proposition .....	191
5.4.3 Competitive Landscape .....	191
5.4.4 Market Saturation .....	191
5.4.5 Consumer Behavior .....	192
5.4.6 Adoption Patterns .....	192
5.4.7 Innovation Adoption Lifecycle: .....	192
5.5 External factors.....	193
5.5.1 Government Regulations .....	193
5.5.2 Technological Change:.....	193
5.5.3 Economic Conditions .....	194
5.5.4 Social and Cultural Factors .....	194
5.5.5 Environmental Sustainability .....	195
5.6 Social factors .....	195
5.6.1 User Satisfaction.....	196
5.5.2 Digital Literacy.....	196
5.6.3 Technology Acceptance: .....	196
5.6.4 Trust and Privacy.....	197
5.6.5 Social Influence .....	197
5.6.6 Cultural Factors .....	197
5.6.7 User Experience (UX) Design:.....	198
5.7 Financial investment in ICT .....	198

5.7.1 Technology procurement.....	198
5.7.2 ICT Infrastructure Investments.....	199
5.7.3 Software Development Costs .....	199
5.7.5 Hardware Procurement.....	199
5.7.6 Personnel .....	200
5.7.9 Human Resource Allocation.....	200
5.7.10 ICT Talent Acquisition and Retention .....	200
5.7.11 Training and Development Initiatives .....	201
5.7.12 Budget Allocation for ICT Projects.....	201
5.7.13 Funding Sources .....	201
5.7.14 Return on Investment (ROI) Analysis.....	201
5.8 Model validation.....	202
5.8.1 Response Rate .....	203
5.8.2 Distribution of respondents by gender .....	203
5.8.3 Respondents distribution by Age.....	203
5.8.4 Experts level of Education.....	204
5.8.5 Experts Level of Experience .....	204
5.8.6 Consideration of Model as relevant to disruptive ICTs adoption.....	205
5.8.7 Contribution of Technological features to disruptive ICTs.....	206
5.8.8 Influence of market forces on disruptive ICTs.....	207
5.8.9 Role of External forces on disruptive ICTs adoption.....	208
5.8.12 influence of social factors on disruptive ICTs adoption.....	209
5.8.13 Financial investment in ICT innovations .....	209
5.8.14 Disruptive ICTs model validation discussion.....	210
<b>CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS.....</b>	<b>212</b>
6.1 conclusion.....	212

6.2 Recommendations .....	214
6.2.1 Recommendation to authorities .....	214
6.2.2 Recommendations to Organizations .....	215
6.3 Areas of further research .....	216
<b>REFERENCES .....</b>	<b>217</b>
<b>APPENDICES.....</b>	<b>238</b>
<b>APPENDIX 1: INTERVIEW CONSENT FORM.....</b>	<b>238</b>
<b>APPENDIX 2: NON-DISCLOSURE AGREEMENT (NDA FORM) .....</b>	<b>240</b>
<b>APPENDIX 3: QUESTIONNAIRE .....</b>	<b>241</b>
<b>APPENDIX 3: NACOSTI APPROVAL.....</b>	<b>250</b>

## LIST OF FIGURES

Figure 2.1: Sales of successive generations of microprocessors and disk drives.....	41
Figure 2.2: Theory of disruptive innovation. Adopted from [44] .....	77
Figure 2.3: Proposed Disruptive Innovation Model .....	82
Figure 4: Conceptual model .....	101
Figure 4.9: ICT innovation architecture affects its acceptability .....	140
Figure 4.19: ICT policies influence ICT innovations success.....	152
Figure 4.27: Financial investments in ICT innovations influence the success of ICT innovations .....	160
Figure 4.31: the organization has funds set aside for support of ICT innovations..	164

## LIST OF TABLES

Table 1: Top 3 Bank transation volume in kenya across various platforms .....	26
Table 3.4: Reliability Statistics for ICT implementation environment .....	125
Table 5.1: Years of experience .....	203
Table 5.2: Influence of model availability on adoption .....	204
Table 5.3: Technological features and its influence on disruptive ICTs .....	205
Table 5.4: Market forces and disruptive ICTs adoption .....	206
Table 5.5: Influence of government policies on disruptive ICTs adoption .....	207
Table 5.6: Influence of Social factors on disruptive ICTs adoption .....	208
Table 5.7: financial investment on ICT innovations .....	209

## **LIST OF ABBREVIATIONS AND ACRONYMS**

AI: Architectural innovation

AI: Artificial intelligence

ATM: Automated teller machine

CI: Competitive intelligence

CI: Continuous innovation

GDP: Gross domestic product

IBM: International Business Machines

ICT: Information Communication Technology

IT: Information Technology

KCB: Kenya Commercial Bank

KP&TC: Kenya Post & Telecommunications company

MI: Modular innovation

NDA: Non-disclosure agreement

OECD: Organization for economic co-operation and development

PC: Personal computer

R&D: Research and development

SMS: short messaging service

## CHAPTER ONE: INTRODUCTION

### 1.0.1 OVERVIEW

This chapter discusses the background of the study, problem statement, the objectives of the study, justification and significance of the study.

#### 1.1 Background to the study

Advancements in information technology is a key catalyst for growth in industrialized economies. Research demonstrates that nations progress through three phases in the implementation of innovation strategies: acquiring innovation via global trade, adopting incremental innovation from other countries to improve efficiency, and ultimately, achieving autonomous innovation to establish a competitive advantage. As communication progresses and worldwide businesses flourish due to rapid growth in the IT industry, critical issues regarding radical innovation and the integration of new technologies must be addressed. [2].

Disruptive innovations denote a process whereby a smaller firm with little resources successfully competes against established incumbent companies. Innovative technologies serve as the catalysts for economic expansion. Following the foundational studies of [5] and [6], other researchers have determined that technological advancement is crucial to the growth process.

Life is organized around technology. While we want to govern our lives, many of our activities are influenced and shaped by the technology that surrounds us. [7]. Therefore, it is not unexpected that the emergence of new technology, as older technology advances or becomes outdated, may be regarded as disruptive [8]. The disruption arises when the introduced technology impacts the social structures that

underpin our lives [9]. He contends that while disruptive technology frequently supplants current technology, it is essential to acknowledge that this substitution likewise disrupts the social frameworks linked to the obsolete technology. Disruption is often regarded as a negative force, and to a certain degree, it is. Disruption affects the status quo, causing beneficiaries to view the force as harmful. [10]. Individuals who may not gain from the current situation may nonetheless view disruption as harmful, as it represents a shift from the known to the unknown. [7].

The concept of disruptive innovation has gained prominence among managers, despite pervasive misunderstandings about its core principles [11]. Disruptive innovation clarifies how new organizations, aiming to offer more cost-effective and accessible solutions, can constantly supplant established corporations, often before the incumbents and their leaders acknowledge the looming demise of their businesses. [12]. Disruptive IT innovation is characterized as an essential yet insufficient architectural innovation stemming from the IT foundation, which profoundly and extensively influences systems development processes and services.

A new technology requires time to attain economic relevance. Initially, it must be integrated into the economy (innovation) [14]. Subsequently, it gets progressively embraced by many individuals (diffusion). The previous decade has shown significant advancements in the economics of innovation. Nevertheless, despite scholars focusing extensively on the history of technical advances, insufficient attention has been devoted to the economics and value of technology dissemination [16]. Diffusion is as crucial as innovation; no new technology exert economic influence unless they achieve widespread adoption throughout the economy. Diffusion is a complex process that often requires an extended duration. Furthermore,

in numerous instances, invention and spread are interconnected. This research seeks to elucidate the process of technological disruption.

In the relentless pursuit of competitive advantage and market dominance, global manufacturers are progressively seeking to embrace innovative technologies. The Industrial Internet of Things represents a recent wave of technological advancements that have been embraced to have been adopted by manufacturers worldwide within their production facilities [17]. Organizations are seeking rapid implementation and expedited monetization strategies; however, they remain ambivalent regarding which digital strategy or technology would effectively meet their underlying requirements [18]. Big data, predictive analytics, cloud infrastructure, cognitive computing, and other aspects of the industrial Internet of Things have created a flourishing market, and top IT businesses and startups are trying to take advantage of it [19].

### **1.1.1 Disruptive Innovations**

New technologies that drastically change how industries and corporations function are known as disruptive technologies [20]. The emergence of a transformative technology within any sector can compel established organizations to reevaluate their operational methodologies, potentially jeopardizing their market position or leading to obsolescence.

As noted in [21], disruptive technology refers to any enhanced or completely new technology that replaces and undermines an existing technology, ultimately leading to its obsolescence. It is designed to enhance and improve upon the technology that is presently in use. The business dictionary ([businessdictionary.com](http://businessdictionary.com)) defines disruptive technology as innovative methodologies that challenge or supplant

traditional business techniques and practices. Consider, for example, the steam engine emerging in the age of sail and the internet arising in the epoch of postal communication. Disruptive technology is defined as Disruptive technology profoundly transforms the operational dynamics of businesses and entire industries [23] [17]. It often necessitates that organizations revise their business strategies to prevent the erosion of market share or the risk of obsolescence. Disruptive innovations present unique approaches to value delivery and have the potential to fundamentally alter corporate processes or entire industries [24].

The notion of disruptive technology was first presented and examined within scholarly discussions by [25]. Disruptive innovation denotes a phenomenon in which a product or service initially secures a foothold in fundamental applications at the lower tier of a market, subsequently advancing to supplant established competitors.

This study seeks to clarify the differences between disruptive innovation and disruptive technology. Disruptive innovation and disruptive technology can be perceived as equivalent concepts. Disruptive innovation refers to inventions and technologies that make sophisticated products and services available and more affordable to a wider audience, fundamentally transforming traditional business models. On the other hand, disruptive technology refers to the innovations utilized to challenge and destabilize the existing framework.

Organizations frequently advance their innovations at a pace that outstrips the development of client requirements, leading to the provision of products or services that are often overly intricate, expensive, and convoluted for a substantial segment of their intended audience. Organizations pursue "sustaining innovations" within the higher tiers of their markets, as this approach has traditionally enabled their

prosperity: by levying premium prices on their most discerning and sophisticated customers, they achieve optimal profits. In this process, companies unintentionally foster the rise of innovative concepts within the lower segments of the market. [26]

An innovative disruption allows a demographic that was previously marginalized at the lower end of a market to access a product or service that was once restricted to those with wealth or advanced skills.

Disruptive innovations, especially in their early stages, often display characteristics such as diminished gross margins, constrained target markets, and more basic products and services that may appear less attractive than established alternatives when assessed through traditional performance criteria. The lower market tiers, marked by reduced gross margins, dissuade companies from striving to elevate their position within the market hierarchy, thereby enabling the rise of new disruptive competitors at the foundational level of the market. [27]

Disruptive innovations initially present a lower quality at a reduced cost in comparison to established market leaders. However, they eventually surpass the price-performance equilibrium by enhancing their quality while frequently becoming increasingly economical over time. Disruptive innovation challenges the traditional notion that increased investment is essential for achieving higher quality. [28]

### **1.1.2 Disruptive ICT**

Market disruptions resulting from developments in ICT systems, computer hardware, and software are referred to as disruptive ICTs [29]. Due to the rapid obsolescence of ICT advancements and the swift appearance and dissemination of new disruptive technologies, it is essential that relevant institutions and model conditions are updated promptly. Technology standards and regulations are crucial enablers or obstacles to

the progression of ICT innovation systems [30]. The policy implication is that the timing of institutional reform is paramount.

Setting new standards and amending regulations can provide a competitive edge. The relevant regulations apply not only to the ICT sectors but also to associated businesses and policy areas, including transportation (e.g., automated driving), healthcare (e-health), and finance (e.g., crowdfunding and blockchain applications). Due to the increased importance of ICT innovation in several industries and policy domains, ICT innovation policy has developed into a horizontal policy field that maintains systemic links with other policy fields. [31]

### **1.1.3 The Banking industry**

The concept of banking has endured for millennia and has continually evolved to meet changing human needs. The birth of modern banking and banknote issuance occurred in the 17th century. Wealthy merchants would entrust their wealth to London goldsmiths for safekeeping in secure vaults for a fee. The goldsmiths issued a receipt for every deposit, indicating the quality and quantity of the gold. If a customer wishes to access the gold, they must provide the document to extract it from the vault. Ultimately, they may employ the paper as a medium of exchange in retail establishments. Paper receipts swiftly came to be considered comparable to metal, resulting in the creation of paper currency. Ultimately, commodity-backed currency was replaced by fiat currency, which was no longer linked to gold. The first Automated Teller Machines (ATMs) were developed in the 1960s, with the earliest models appearing by the end of the decade. Banks initiated substantial expenditures in computer technology to automate huge manual processes, marking a shift from large clerical workforces to sophisticated automated systems. By the 1970s,

preliminary payment systems emerged, facilitating the development of electronic payment systems for both domestic and international transactions. The international SWIFT payment network was established in 1973, and domestic payment systems were developed worldwide through cooperation among banks and governments. The financial services sector has seen a substantial transition in the modern digital era. A business that was predominantly static for many decades is now in a constant state of evolution, with various banks endeavoring to adapt.

### 1.1.4 Disruptive innovations in Kenya’s Banking sector

#### 1.1.4.1 Online banking

**Table 1: Top 3 Bank transaction volume in Kenya across various platforms**

<b>Top 3 Kenyan Banks’ Transaction Volume by Channel</b>					
<b>Bank</b>	<b>KCB</b>	<b>Equity Bank</b>	<b>Cooperative Bank</b>	<b>Average</b>	<b>Combined</b>
<b>CBK Market Share Index*</b>	<b>14.1%</b>	<b>9.9%</b>	<b>9.9%</b>		<b>33.9%</b>
Mobile and internet	55.0%	79.0%	28.1%	54.0%	
Agency	20.0%	12.0%	32.2%	21.4%	
ATM	13.0%	4.0%	28.7%	15.2%	
Branch	12.0%	3.0%	10.6%	8.5%	
Others		2.0%	0.4%	1.2%	

Online / internet banking is an electronic payment system that enables customers of a bank or other financial institution to conduct a range of financial transactions through

the institution's website or smartphone application. In Kenya, the online banking revolution has caused a restructuring of the traditional banking model, as highlighted below:

Source: Individual Banks' Q3'2018 Investor Briefing / CBK

\*Market Share weighted by total assets, total deposits, shareholders' funds, number of deposit accounts, and number of loan accounts

Among the top three banks by market share, mobile and internet banking constitute the most utilized transaction channel, accounting for an average of 54.0% of total transactions. This has led to diminished branch activity, averaging 8.5% of the total transaction volume. Financial institutions perceive technology innovation as a method for enhancing efficiency and minimizing expenses. However, the drawback has been the adverse effect on employment, resulting from branch closures and widespread layoffs. The Central Bank of Kenya reports that the banking sector's efficiency, quantified by the ratio of deposit accounts per employee, has surged by 100.5%, rising from 770 in 2014 to 1,544 in 2017. This improvement is attributed to a 16.3% reduction in banking staff, decreasing from 36,923 in 2014 to 30,903 in 2017, alongside a 67.8% increase in deposit accounts. The charts below illustrate the trends in efficiency scores and personnel numbers within the banking sector.

#### **1.1.4.2 Mobile Money:**

Mobile money is an electronic wallet service enabling customers to save, transmit, and receive funds using their mobile phones. Mobile money was launched in Kenya in 2007 using Safaricom's M-Pesa platform. [32] Since that time, the service has achieved nationwide adoption. As of September 2018, data from the Communications

Authority of Kenya indicated that the mobile penetration rate in Kenya was 100.1%, with active mobile money subscribers comprising 64.5% of the population. In 2018, the Central Bank of Kenya (CBK) announced that Ksh. 4.0 trillion was transacted using mobile money, representing 45.3% of the nation's GDP.

#### **1.1.4.3 Digital Lending:**

The digital lending sector has expanded rapidly in recent years. Since the inception of the M-Shwari platform in 2012, numerous platforms providing these services have proliferated. Recently, Safaricom introduced Fuliza, an overdraft service that allows M-Pesa consumers to execute mobile payment transactions even when their M-Pesa balance is insufficient. During the inaugural week of its opening, over one million clients registered and borrowed Kshs 1.0 billion; by the end of the first month of operation, the total borrowed amount reached Kshs 6.2 billion. This expansion in digital lending can be partially ascribed to the following factors;

##### **1.1.4.3.1 Implementation of the Interest Rate Cap**

The interest rate cap was implemented on September 14, 2016, capping borrowing rates at 4.0 percentage points above the Central Bank Rate, which is now 9.0%. The implementation was prompted by public concerns about the exorbitant cost of credit in Kenya, perceived as an obstacle to credit accessibility for a significant portion of the population. The implementation of the law was anticipated to reduce credit costs and enhance access to credit. Consequently, there has been a significant reduction in credit growth, evidenced by a decrease in private sector loan growth to 2.4% in December 2018, in contrast to a 5-year average of 11.8%, and prior to the implementation of the rate cap legislation, the 3-year average was also 11.8%. The

majority of individuals and SMEs have been excluded from receiving credit, as banks have favored lending to the government over the public, whom they consider high risk.

#### **1.1.4.3.2 High Mobile Penetration Rate:**

The Communications Authority data from September 2018 indicates that Kenya's mobile penetration is at 100.1%. The Jumia Mobile survey forecasts smartphone penetration at roughly 45.5% of mobile subscribers.

The aforementioned conditions lead to: (i) a deficiency in credit supply, and (ii) a mechanism to provide the necessary services to the intended market. Digital lending resolves this issue by offering immediate unsecured loans via mobile platforms. The complete process, encompassing customer registration, loan application, underwriting, payout, and repayment, can be entirely automated. Consequently, numerous start-ups are currently wagering on this strategy to revolutionize conventional lending structures.

#### **1.1.3 A case of Kenya post and Telecommunication Corporation (KP&TC)**

The information and communication technology (ICT) sector in Kenya has experienced a significant transformation. Approximately two decades ago, in the mid-1990s, the sector was a nuisance to the political system and was primarily discussed by enthusiasts in subdued tones. The political system perceived growing ICTs as a threat to its leaders' authority and dominance over information dissemination. The initial attempts to introduce the Internet in Kenya in 1995 faced an official rejection, exemplified by a full-page advertisement from the Kenya Posts and Telecommunications Corporation (KP&TC), a state monopoly, asserting that Internet

services constituted resale and were thus illegal. The Internet was established in Kenya within this challenging atmosphere. It was completely prohibited in the federal civil service until 1999.

Since the Kenyan government initiated official liberalization in the telecommunications sector in 1999, significant progress has been attained. The liberalization process commenced with the release of two crucial documents [34]. These documents pertain to the Kenya Communications Act of 1998 and the Telecommunications and Postal Sector Policy Statement of 1999. At the time of drafting these two documents, Kenya's telecommunications sector was predominantly underdeveloped and very inefficient. The objective of these texts was to instigate reforms within the sector to align it with the changes and opportunities presented by the global environment [35]. The Telecommunications and Postal Sector Policy Statement was issued in 1999. The specific objective is to rejuvenate the sector and position it to facilitate the country's emergence as a renowned regional hub for financial and industrial operations. This policy document delineated the specific division of the Kenya Posts and Telecommunications Corporation (KP&TC). It was intended to implement the functions of the regulatory agency, the telecommunications service provider, and the postal service provider [36].

These innovations positioned the telecommunication sector in Kenya on a trajectory of expansion that has subsequently revolutionized not only the telecommunications business but also the whole Kenyan economy.

These alterations significantly disrupted numerous businesses, including communication, banking, travel, and tourism, as well as nearly every other sector of the economy. In communication, the Kenya Postal Corporation was among the initial

casualties, as was Telkom Kenya concerning landline telephones, after having long maintained a monopoly in this area. The government's initial efforts to safeguard these parastatals were unsuccessful. The disruptive evolution of mobile phones compelled the government to acquiesce, resulting in the establishment of Safaricom and the entry of Celtel Inc. into the mobile services sector. Nevertheless, Posta Kenya and Telkom Kenya failed to thoroughly assess the market disruption and adapt their strategy to the changing technological and societal demands. [37] By 2002, these businesses had relinquished leadership of the telecommunications industry, as new entrants Safaricom and Celtel dominated the market.

The Kenyan telecommunications sector, along with its subsequent convergence with banking services, exemplifies the profound disruption caused by emerging technologies. However, [3] cautions that labeling any scenario in which an industry is unsettled and established incumbents falter as 'disruptive technology' may be excessive, potentially diluting the term and complicating its application in delineating a competitive trajectory for innovation or existing enterprises. Consequently, they assert that associating disruptive innovation with any discovery that alters an industry's competitive dynamics is problematic, as various types of innovation necessitate distinct strategic methodologies. It is crucial to recognize that the insights gained regarding success as a disruptive innovator, or in countering a disruptive challenger, will not be universally applicable to all companies in a dynamic market. To ensure the theory functions properly, innovators and researchers must refrain from negligence and incorporate insights from later study and experience into the original theory, so equipping managers with appropriate tools for their settings and enhancing their likelihood of success.

The researcher aims to determine not if disruptive tendencies in ICT innovations can be quantified, but how this quantification might inform the construction of a model for disruptive potential in ICT innovation. According to [38] [39], it is feasible to assess the potential of an innovation to disrupt the market or industry by examining its qualities.

## **1.2 Statement of the problem**

While theories have been developed to explain information technology innovation in an increasingly globalized context, too many of these theories focus on the complicated global dynamics predominantly in relation to how they affect the innovation potential in developed economies ignoring the complex economic and social dynamics in developing economies. Despite numerous innovation theories, too many of these theories fail to capture the realities of ICT adoption in developing economies. Many innovations are introduced but struggle to diffuse across sectors. As a result, many ICT systems face redundancy or lead to obsolescence before achieving large-scale adoption. This study therefore sought to develop a model and reference architecture that captures the unique dynamics of disruptive ICT adoption in developing economies, focusing on Kenya as a representative case.

## **1.3 Objectives of the study**

### **1.3.1 General objective**

The main aim of this study was to develop a disruptive ICT innovation model and reference architecture suitable for developing economies, with specific application to Kenya.

### **1.3.2 Specific objectives**

- i. To assess the status of disruptive ICT innovations in Kenya.
- ii. To determine through the lens of a theoretical model the factors that influence disruptive ICT innovations.
- iii. To develop a model for adoption of disruptive ICT innovations.
- iv. To propose an architecture for adoption of disruptive ICT innovations in developing economies.

### **1.4 Research questions**

- i. What is the status of disruptive ICT innovations in Kenya?
- ii. Which theoretical model determines the factors that influence disruptive ICT innovations?
- iii. Are there models for adoption of disruptive ICT innovations for developing countries?
- iv. Are there Architectures for adoption of disruptive ICT innovations for developing countries?

### **1.5 Justification of the study**

Historically, less than 10% of companies have managed to maintain growth that yields above-average shareholder returns for more than a few years. When a company's growth stagnates, the likelihood of effectively revitalizing growth is about 6%. [41] [42] observes that historically, it has been unfeasible to anticipate which technologies will successfully generate fresh growth waves and which will falter. Nonetheless,

Authors in [43] contends that merely 20% of venture capital-backed start-ups achieve success, whereas only 25% of new goods introduced by established firms succeed. In an age of rapid ICT breakthroughs that cause significant market disruptions, it is crucial for enterprises to recognize potential ICT forces that may disrupt their operations early in the development stages and to establish frameworks to support or adopt such innovations.

According to [33], the combination of knowledge and technologies makes a powerful tool for change. Hence there is no question that the transformation in businesses, governments, individuals and organizations today and tomorrow will be driven by ICT. The capability to harness the power presented by computing as the core transformative element hence stands out to determine how each of these social elements perform yet non of them operates in a vacuum[44]. How the various social, technological and organizational factors interact in a coherent system plays a critical role in determining the success of any technology that is developed. This research thus aims to put together a coherent theoretical model for disruptive innovations.

Authors in [11] identifies the need for disruptive innovation model as among key research area that holds great promise not just only for improving disruptive innovation theory but also for stimulating research that prepares companies for managing effectively in the age of disruption. Further, [45] opines that “given that a firm’s innovation strategy depends on the projects it invests in, an integrated approach that combines strategy and finance might remove some of the impediments to innovation that arise from considering these concepts separately. With this, research by [11] concludes that research could inform the best mix of financial instruments

and investors, each with specific time-horizons and risk-limits, to influence adoption of an innovation” .

### **1.6 Significance of the study**

The study, analysis and understanding of disruptive technologies are a key requirement for businesses today. In an era where technology is rapidly changing driven by a demand for more advanced ICT products by the masses, no organization can survive without the capability to determine which new ICT innovation has the capability to effectively alter the market to its disadvantage. This will thus enable organizations to be proactive and not reactive in the dynamic business environment. The research goal was therefore meant to enable organizations determine what ICT innovations to adopt in the earlier stages of development as well as enable firms to effectively predict and develop ICT innovations that place their firms at a higher competing level than their competitors.

### **1.7 Scope of the study**

The study aimed to develop a model for the adoption of disruptive Information and Communication Technology (ICT) innovations in the banking sector, specifically focusing on Small and Medium Enterprises (SMEs) within developing economies. It identified and analyzed key technologies such as mobile banking, e-commerce platforms, cloud computing, and AI-powered financial solutions that had the potential to transform financial services for SMEs. Additionally, the research explored critical factors which influenced the adoption of these technologies, including technological aspects like perceived usefulness and ease of use, as well as organizational factors

such as leadership support and resource availability. By examining these variables, the study sought to develop a comprehensive model that not only enhanced understanding of the challenges and opportunities faced by SMEs in integrating disruptive technologies but also provided actionable insights for policymakers and industry stakeholders to promote innovation and foster sustainable growth in the banking sector.

### **1.8 Limitations of the study**

The researcher assumed that the ICT innovation is not just an incremental improvement but a disruptive force, implying that it has the potential to fundamentally change how things are done in a particular sector or context. The researcher also assumed that developing countries face a disadvantage in adopting ICT innovations compared to developed economies, due to factors like limited infrastructure, lower levels of digital literacy, and different socio-economic conditions. The researcher also assumed that the respondents had sufficient interactions with the digital innovations, hence had a clear understanding of these systems thus, were open and sincere in their responses.

### **1.9 Assumptions of the Study**

The researcher assumed that the ICT innovation is not just an incremental improvement but a disruptive force, implying that it has the potential to fundamentally

change how things are done in a particular sector or context. The researcher also assumed that developing countries face a disadvantage in adopting ICT innovations compared to developed economies, due to factors like limited infrastructure, lower levels of digital literacy, and different socio-economic conditions. The researcher also assumed that the respondents had sufficient interactions with the digital innovations, hence had a clear understanding of these systems thus, were open and sincere in their responses.

### **1.10 Structure of the thesis**

This thesis is divided into the following sections

Chapter one presents an introduction to the study. The overall aim of this chapter is to lay the ground for the study and present a case for the justification of the study. The chapter discusses the problem statement, presents the objectives of the study as well as the research questions, significance and scope of the study. The chapter also introduces the concept of disruptive innovations and specifically disruptive innovations in the ICT sector.

Chapter two is the literature review for the study. The chapter presents an in-depth study of disruptive innovations and builds from literature the considered constructs for a disruptive innovation models model. The basis of the model is derived from studies relating to disruptive innovations and the arguments of the various authors.

This chapter is divided into several sub sections including theoretical literature, Nature of innovations, emerging disruptive innovations, existing disruptive innovations models, innovation models, conceptual model and a summary of literature review.

Chapter three discusses the methodology that the researcher used in achieving the results of this research. This chapter discusses the research design, the data collection instruments, data collection procedures, data analysis and presentation as well as the ethical considerations.

Chapter four is the data analysis and presentation. It presents the detailed discussion of the findings of the research based on the analysis of the data collected. The chapter there after presents the proposed disruptive ICT models and a justification for the same including a discussion of the various models constructs.

Chapter five is the proposed disruptive architecture. It aims at presenting an overall summary of the research as well as the conclusions based on the research and the identified research gaps.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Introduction

This chapter presents a review of literature relating to disruptive ICTs. It is divided into the section: Theoretical model, Empirical literature including conceptual model, gaps in literature review and a summary of literature.

### 2.2 Theoretical literature

#### 2.2.1 Theory of disruptive innovations

In the Innovator's Dilemma, [21] elucidated the reasons for the collapse of esteemed and effectively managed enterprises. Outstanding managers encounter a paradox, he asserted, as their necessary actions for success—listening to consumers, investing in the firm, and developing unique capabilities—may lead to the neglect of competitors with "disruptive" inventions.

Christensen's (1997) classic illustration of the **disk drive industry** provides a compelling example of how disruptive innovations evolve and reshape markets. Initially, smaller disk drives, such as the 5.25-inch models, were introduced by new entrants targeting low-end users who valued affordability and simplicity over performance. Incumbent firms, focused on serving their high-end customers, ignored these seemingly inferior technologies. Over time, however, the smaller drives improved in performance while retaining their cost advantage, eventually displacing the dominant larger drives in mainstream markets. This pattern—beginning with underperformance in mainstream attributes but excelling in emerging ones—captures the essence of disruption. The case demonstrates that disruptive innovations succeed not because they outperform existing technologies at inception, but because they

introduce new performance dimensions valued by different customer segments. The relevance of this illustration to developing economies lies in the way affordable and contextually appropriate ICT solutions can displace expensive legacy systems, thereby transforming service delivery and accessibility across sectors.

In formulating this thesis, [21] analyzes the historical trajectory of the disk drive business to illustrate instances of disruption and the attributes by which these disruptive innovations impacted the market [46]. Understanding this history reveals remarkably simple and constant characteristics that have consistently influenced the successes and failures of the industry's leading enterprises amidst its complexity. The most successful organizations thrived by attentively responding to consumer feedback and making substantial investments in technology, goods, and manufacturing capacities that addressed their customers' future requirements. [47] Paradoxically, when the leading enterprises subsequently collapsed, it was due to the same reasons: they attentively listened to their customers and spent heavily in the technology, goods, and production capabilities that addressed their customers' future requirements. [21] This exemplifies a classic innovator's dilemma: Unquestioningly adhering to the principle that effective managers must remain closely aligned with their customers and endeavor to fulfill their product and service requirements can occasionally prove to be a detrimental error. By grounding his theory in the examination of the disk drive industry, [21] asserts that managing the incessant barrage of technological change resembles the challenge of ascending a mudslide cascading down a hill; one must exert every effort to remain atop it, and any pause to recuperate results in being overwhelmed.

[3] list and describe the four main components of the theory of disruption: (1) that market leaders are improving along a trajectory of sustained innovation; (2) that they surpass customer needs; (3) that they are able to react to disruptive threats; and (4) that the disruption causes the leaders to fail. This analysis of technological evolution within the disk drive business identified two distinct categories of technological change, each exerting markedly different impacts on the industry's leaders. First-type technologies maintained the industry's advancement in product performance, measured primarily by total capacity and recording density, and varied in complexity from incremental to radical. The leading corporations in the sector consistently spearheaded the development and implementation of these technologies. Conversely, innovations of the second type altered or redefined performance trajectories, consistently leading to the failure of the industry's dominant enterprises [48].

[49] offered additional information to enhance comprehension of the theory of disruptive innovation and to clarify the distinction between disruptive and sustaining innovations, as illustrated by [21] through a case study on the effects of a new generation of Pentium processors. [49] also indicates that the introduction of the Pentium III computer processor in the final quarter of 1998 coincided with a decline in sales of the P-2, which persisted as P-3 sales increased. Similarly, sales of the P-3 reached their zenith coinciding with the introduction of the Pentium 4 chip and subsequently declined precipitously as Pentium 4 sales escalated. This pattern is readily identifiable: a new, faster generation of microprocessors swiftly supplants the previous one, first at the top end of the market and progressively permeating the lower end. The new generation exerts a disruptive influence on the sales of its predecessor. Nevertheless, despite this swift cannibalization, [21] does not characterize the new generation of microprocessors as a disruptive invention. It is, instead, a sustaining

invention. Both inventions are propelled by consumer desires. Figure 1 illustrates the distinction between sustaining innovation and disruptive innovations [50].

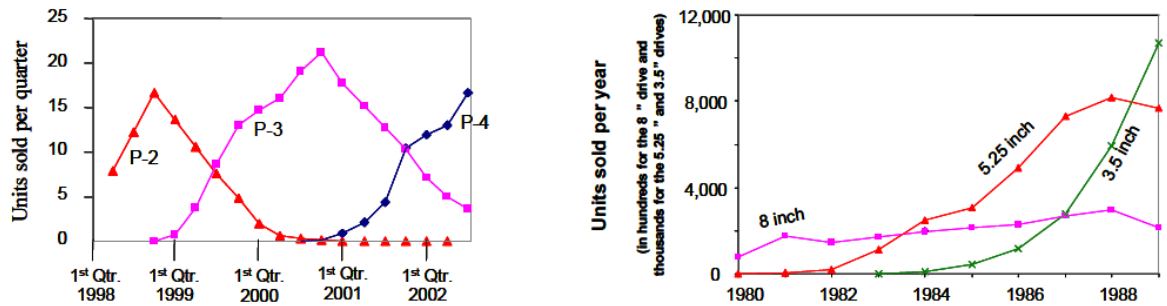


Figure 1.1: Sales of successive generations of microprocessors and disk drives

It is essential to acknowledge that although the P-2, P-3, and P-4 were all developed by the same company (Intel), this is not the rationale for a newer, faster microprocessor being sustaining rather than disruptive [21]. Even if a competitor to Intel, like as AMD, had introduced the P-4, it would still constitute a sustaining innovation. Certainly, a fundamental aspect of [21]'s research is to encourage incumbents to implement disruptive ideas rather than concentrating predominantly on sustaining advances.

Compare the microprocessor experience with the data presented in the right frame of Figure 1 for successive generations of computer disk drives. Subsequent iterations of disk drives decreased in physical dimensions: the 8-inch drive was succeeded by the 5.25-inch drive, which was subsequently followed by the 3.5-inch drive. Observe that the sales of the 8-inch drive persisted in their growth despite the increasing sales of the 5.25-inch drive. In contrast to the P-3's significant disruption of the P-2, the 5.25-

inch drive did not originally pose a substantial threat to the preceding 8-inch generation. Concurrently, sales of the 5.25-inch drive persisted in their increase despite the rapid growth in sales of the newer 3.5-inch drive. In contrast to the P-4's disruption of the P-3, the 3.5-inch drive initially did not significantly impact the 5.25-inch generation. Nevertheless, the disk drive illustration is a quintessential example of disruptive innovation as presented by [21].

The microprocessor exemplifies an innovation that immediately disrupts sales of the existing product, yet does not qualify as a disruptive innovation according to [21]'s definition. Conversely, the disk drive represents an innovation that is initially non-disruptive but ultimately qualifies as a disruptive innovation [44]. The prolonged encroachment of the new 5.25-inch drive into the established 8-inch drive market can be attributed to its initial establishment of a new low-end market for desktop computers, subsequently advancing into higher-end goods like mid-range and mainframe computers. The non-disruptive characteristics of a disruptive breakthrough in the short term may lead an incumbent to inaction, ultimately resulting in catastrophic disruption in the long term [51].

### **2.2.2 Disruptive Innovation principles**

- In 1997, [21] introduced the concept of disruptive innovation. Subsequently, the application of the theory to characterize innovations that transformed markets was extensively adopted, prompting a cautionary note in 2015 [3] to prevent the theory from being excessively manipulated to accommodate every concept or scenario. Every decision maker must recognize the concepts

behind the notion of disruptive innovation as established in the original framework. [28] The principles encompass:

- Typically launched or effectively brought to market by an external organization. Current competitors infrequently implement disruptive innovations. When they attempt this, they seldom achieve success in the newly established market. For instance, Netflix launched its DVD-by-mail service during the nascent phase of DVDs. Netflix emerged as a novel entrant in the home video market.
- Generally aims at an underserved or altogether novel market. The idea primarily aims at a demographic of consumers who do not require the intricacies of current products. Equity Bank initially focused on the predominantly impoverished, unbanked demographic in rural regions by reducing the expenses associated with opening and keeping a bank account. Traditional banks mandated high minimum balances for account operation; however, Equity Bank eliminated these fees along with the initial account opening charges. Since that time, Equity Bank has predominantly relied on the same "underserved and neglected" clientele it initially aimed to serve.
- Initially substandard compared to established items. Innovation often commences with inferior performance compared to established items. It is regarded as "satisfactory" and potentially "more straightforward" than the current situation. The Safaricom Mobile Money service (MPesa) initially faced challenges such as limited connectivity, opposition from established banks, a scarcity of agents, and a lack of trust regarding the security of the mobile system in handling financial transactions.

- More economical than conventional or existing items. Current products typically grow excessively intricate as additional “features” are incorporated, resulting in increased costs. Upon introduction, the disruptive innovation is markedly less expensive than comparable products. For instance, in contrast to professional dental whitening, which averages Ksh. 40,000, whitening strips provide comparable effects with a more convenient approach and a reduced cost of Ksh. 4,000 for a two-week duration.
- Usually facilitated by an enabling technology. Disruptive innovations are driven by technologies that undergo swift enhancements in performance, such as computing, mobile communications, nanotechnology, and biotechnology. This feature propels disruptive innovation into progressively intricate marketplaces. The Internet enabled Netflix to implement a novel business model by initially providing web-based DVD rentals and subsequently, immediate video streaming.

### **2.2.2 The Technology Acceptance Model (TAM)**

The Technology Acceptance Model (TAM) is a prevalent paradigm for comprehending users' acceptance and adoption of technology. It was originally proposed [52] and has subsequently been widely implemented and expanded across other disciplines. The TAM seeks to elucidate the determinants affecting consumers' aspirations to adopt a specific technology and its ensuing actual utilization.

The fundamental elements of the TAM are perceived utility (PU) and perceived ease of use (PEOU). Perceived usefulness denotes the extent to which an individual believes that utilizing a specific technology would improve their job performance or yield advantages. Perceived ease of use pertains to the degree to which an individual believes that utilizing the technology will require minimal effort and be

straightforward. According to TAM, both PU and PEOU have a favorable impact on users' attitudes toward technology, which in turn influences their actual usage behavior and intention to use it [54].

The TAM has been utilized across various IT contexts, including but not limited to:

1. Software Applications: The TAM has been extensively utilized to assess the acceptance and uptake of software applications. Researchers have investigated the determinants affecting users' acceptability of productivity software, customer relationship management systems, e-commerce platforms, and other software applications [55].

2. Mobile Technology: The widespread adoption of smartphones and mobile applications has led to the application of TAM in examining consumer acceptance of mobile technologies. Research has investigated the determinants influencing the adoption of mobile banking, mobile health applications, mobile learning platforms, and mobile commerce services.

The Technology acceptability Model (TAM) has been employed to analyze user acceptability and behavioral patterns on social media platforms such as Facebook, Twitter, and Instagram. It has also been utilized to investigate the adoption of online collaboration tools, virtual communities, and various online platforms.

4. E-Learning and Education: The TAM has been utilized to examine technology acceptance within educational settings. Researchers have examined the implementation of e-learning systems, educational software, learning management systems, and various educational technologies.

5. Internet of Things (IoT): With the ongoing advancement of IoT technologies, the TAM has been employed to investigate user acceptance of IoT devices and services. This encompasses applications in smart home systems, wearable technology, healthcare monitoring devices, and industrial IoT solutions.

The TAM has offered significant insights into comprehending users' acceptance and adoption of information technology across several areas. Nonetheless, it is crucial to acknowledge that the TAM is a theoretical construct and may not encompass all elements pertinent to particular circumstances. Researchers have augmented the TAM by integrating variables such as subjective norms, perceived risk, and enabling environments to improve its explanatory capacity.

In conclusion, the TAM has been extensively utilized in information technology to comprehend users' acceptance and adoption behaviors. The fundamental constructs of perceived utility and perceived ease of use have been analyzed across diverse IT contexts, including software applications, mobile technologies, social media, e-learning, and the Internet of Things (IoT). The TAM offers a significant framework for researchers and practitioners to evaluate and enhance technology uptake across several areas [57]

#### **2.2.2.1 Application of TAM in digital innovations**

The TAM is a prevalent theoretical framework for comprehending and forecasting users' acceptance and adoption of novel technologies. It has been utilized in numerous digital inventions across diverse areas, including software, websites, mobile

applications, and other digital platforms. This is an overview of the application of the TAM in digital innovations:

1. Research and Development: TAM has been extensively employed during the research and development phase of digital breakthroughs. It assists designers and developers in comprehending the determinants of users' acceptance of novel technologies and directs them in crafting user-friendly and intuitive interfaces. Integrating TAM into the design process enables developers to recognize potential adoption hurdles and mitigate them proactively.

User Experience Design: TAM offers significant insights into the elements influencing users' perceptions and attitudes around digital advances. Designers can utilize TAM to create interactive and engaging user experiences that correspond with users' expectations and preferences. By concentrating on elements like perceived utility and usability, designers may refine the user interface and improve the overall user experience [59]

User Acceptance Testing: The TAM can serve as a framework for executing user acceptance testing of digital advances. It enables researchers to collect data on consumers' perceptions, attitudes, and intentions regarding the utilization of a new technology. By gathering feedback on perceived utility, usability, and other Technology Acceptance Model characteristics, developers can evaluate the innovation's preparedness for extensive adoption and pinpoint areas for enhancement.

4. Marketing and Promotion: TAM provides essential insights for the marketing and promotion of digital technologies. By comprehending the determinants of user adoption, marketers may customize their messaging and promotional techniques to

highlight the perceived advantages and user-friendliness of the technology. TAM can guide the identification of target groups and facilitate the creation of effective marketing efforts to promote adoption. [59]

The TAM has been employed in several adoption and diffusion studies to analyze the determinants that facilitate or obstruct the extensive adoption of digital advances. By analyzing variables such as perceived utility, usability, subjective norms, and enabling conditions, researchers can ascertain the principal factors affecting the adoption process. This understanding can guide tactics to surmount obstacles and facilitate the effective dissemination of digital breakthroughs.

6. Ongoing Enhancement and Innovation: TAM can be employed beyond the first deployment of a digital innovation. It functions as a foundation for ongoing enhancement and innovation by offering insights into user input and approval. By consistently evaluating and resolving the perceived utility and user-friendliness, developers can implement iterative improvements to the technology, thereby ensuring its sustained acceptance and adoption.

Overall, the application of the Technology Acceptance Model in digital innovations has proven to be valuable in understanding user acceptance and adoption processes. It helps guide research, development, user experience design, marketing, and continuous improvement efforts, ultimately contributing to the successful adoption and diffusion of digital innovations.

### **2.2.3 Theory of reasoned action (TRA)**

The Theory of Reasoned Action (TRA) is a social psychological framework extensively utilized throughout diverse domains, including the examination of digital

advances. This theory offers a framework for comprehending and forecasting human behavior based on an individual's attitudes, subjective norms, and perceived behavioral control. Within the realm of digital innovations, the Technology Readiness Assessment (TRA) aids academics and practitioners in understanding the determinants that affect individuals' acceptance and utilization of novel technologies. This is a survey of the use of the Theory of Reasoned Action in digital advances, accompanied by pertinent citations:

This foundational study utilized the Theory of Reasoned Action and the TAM to comprehend users' acceptance of computer technology. The study discovered that both attitude and subjective norm greatly affect users' intents to utilize technology[52]. [60] conducted a study that expanded the Theory of Reasoned Action by incorporating the notions of perceived usefulness and perceived ease of use, culminating in the TAM. The TAM has been extensively utilized to forecast and elucidate users' acceptance and adoption of diverse digital advancements.

[56]utilized the Theory of Reasoned Action to investigate the adoption of mobile data services. The research indicated that perceptions of mobile data services and social norms substantially affected users' inclinations to embrace these services. [58] merged the Theory of Reasoned Action with the Expectation-Confirmation Model (ECM) to formulate the Technology Continuance Theory (TCT). The TCT was designed to elucidate individuals' persistent utilization of information technology. It evaluates elements including attitude, subjective norm, confirmation, and satisfaction throughout the post-adoption phase.

[61] employed the Theory of Reasoned Action to examine the correlation between Facebook usage and subjective well-being. The research indicated that subjective

norm, attitude, and perceived behavioral control substantially impacted participants' intentions to utilize Facebook, thus influencing their subjective well-being.

These studies constitute a segment of the extensive research utilizing the Theory of Reasoned Action to comprehend individuals' adoption and utilization of digital innovations. The TRA has offered significant insights into the determinants of technology acceptability and has facilitated the development of following models and theories in this field.

### **2.2.3.1 Theory of reasoned action and disruptive innovations**

The Theory of Reasoned Action (TRA) is a social psychological theory that explains human behavior by considering individuals' attitudes, subjective norms, and their intentions to engage in a particular behavior. While the theory itself does not directly address disruptive innovation, it can be applied to understand and analyze the adoption and acceptance of disruptive innovations by individuals or organizations[62].

Disruptive innovation refers to the introduction of a new product, service, or technology that disrupts and fundamentally changes existing markets or industries. It often challenges established norms, practices, and business models. When applying the Theory of Reasoned Action to disruptive innovation, we can examine how individuals' attitudes, subjective norms, and intentions influence their adoption or resistance to such innovations [63].

1. Attitudes: Attitudes play a significant role in the Theory of Reasoned Action. In the context of disruptive innovation, individuals' attitudes toward the innovation can influence their intentions to adopt or resist it. Attitudes are shaped by various factors, including perceived benefits, risks, compatibility with existing practices, and the

perceived advantage over traditional alternatives. Positive attitudes towards the potential benefits of disruptive innovation may increase the likelihood of adoption, while negative attitudes may lead to resistance[64].

2. Subjective norms: Subjective norms refer to individuals' perceptions of social pressure or influence from important others, such as peers, colleagues, or industry experts. In the case of disruptive innovation, subjective norms can influence individuals' intentions to adopt or reject the innovation. If influential individuals or groups endorse and support the disruptive innovation, it may create a positive subjective norm, making adoption more likely. Conversely, if influential individuals or groups discourage or resist the innovation, it can create a negative subjective norm, leading to resistance[65].

3. Intentions: Intentions represent an individual's readiness and willingness to perform a particular behavior. In the context of disruptive innovation, intentions can be influenced by attitudes and subjective norms. Individuals with positive attitudes and perceived positive subjective norms towards the disruptive innovation are more likely to form intentions to adopt it. Conversely, individuals with negative attitudes and perceived negative subjective norms are more likely to form intentions to resist or reject the innovation.

It is important to note that the Theory of Reasoned Action does not directly address the specific challenges or dynamics associated with disruptive innovation. However, by considering the theory's components, we can gain insights into the factors that influence the adoption or resistance to disruptive innovations. Other theories and frameworks, such as the TAM or the Diffusion of Innovations theory, may provide

additional insights into the adoption and diffusion of disruptive innovations in specific contexts.

#### **2.2.4 The Extended Technology Acceptance Model (TAM2)**

The Extended Technology Acceptance Model is an expansion of the original TAM, which was developed by [52]. TAM2 incorporates additional factors that influence technology acceptance and usage. In this response, I'll provide an overview of TAM2 and its key components, supported by relevant citations.

1. Perceived Usefulness (PU): Perceived usefulness refers to the degree to which a person believes that using a particular technology will enhance their job performance or make tasks easier. It is a crucial factor in determining technology acceptance. [54] introduced perceived usefulness as a core construct in the original TAM, which was further supported by many subsequent studies.

Perceived Ease of Use (PEOU): Perceived ease of use refers to the degree to which a person believes that using a technology will be free of effort. It reflects the user's perception of how easy or difficult it is to learn and operate the technology. [54] also introduced perceived ease of use as a core construct in the original TAM.

Subjective Norm (SN): Subjective norm refers to the influence of social factors on an individual's intention to use a technology. It reflects the individual's perception of social pressure to adopt or reject a particular technology. TAM2 introduced subjective norm as an additional construct to capture the social influence on technology acceptance [66]

4. Image (IM): Image refers to the external representation of a technology, including its reputation and social status. It captures the perception of how the use of a technology affects an individual's image and self-presentation. TAM2 incorporated image as a construct to address the influence of image-related factors on technology acceptance [66]

5. Job Relevance (JR): Job relevance refers to the degree to which an individual believes that a technology is relevant and applicable to their job or work context. It represents the perceived alignment between the technology and the user's job requirements. Job relevance was introduced as a construct in TAM2 to account for the impact of contextual factors on technology acceptance [62].

6. Output Quality (OQ): Output quality refers to the perceived quality and accuracy of the information or results generated by a technology. It reflects the user's perception of the usefulness and reliability of the technology's outputs. TAM2 included output quality as a construct to capture the impact of output-related factors on technology acceptance [66]

TAM2 builds upon the original TAM by incorporating these additional constructs to provide a more comprehensive understanding of technology acceptance. By considering factors such as subjective norm, image, job relevance, and output quality, TAM2 acknowledges the role of social influence, contextual factors, and output-related concerns in shaping individuals' acceptance of technology.

### **2.2.5 The Unified Theory of Acceptance and Use of Technology (UTAUT)**

The Unified Theory of Acceptance and Use of Technology (UTAUT) is a widely accepted model in the field of technology acceptance and usage. It was developed by

[62] to understand and predict individuals' intentions to adopt and use information technology. The UTAUT model integrates several previous models and theories, such as the Theory of Reasoned Action (TRA), the TAM, and the Motivational Model (MM), to provide a comprehensive framework[60].

The UTAUT model proposes that four key factors influence individuals' acceptance and usage of technology:

1. Performance Expectancy: It refers to the perceived usefulness of the technology and the extent to which it can enhance an individual's job performance or productivity. Positive performance expectations lead to a higher intention to use the technology.

2. Effort Expectancy: It relates to the perceived ease of use and simplicity of the technology.

If individuals believe that using the technology will be effortless and require minimal mental and physical effort, they are more likely to adopt it

3. Social Influence: It considers the impact of social factors on technology acceptance. This includes subjective norms, social influence, and social support. If individuals perceive that influential people or groups expect them to use the technology, it increases their intention to adopt it.

4. Facilitating Conditions: It refers to the perceived resources and support available to individuals to facilitate technology usage. These conditions include technical support, training, infrastructure, and compatibility with existing systems. Higher levels of facilitating conditions positively influence individuals' adoption and use of technology[67].

In addition to these four core factors, the UTAUT model also recognizes several moderating variables that can influence the relationships among the core factors. These moderating variables include gender, age, experience, voluntariness of use, and individual characteristics [68].

The UTAUT model has been widely tested and validated across various contexts and technologies, including e-commerce, e-learning, mobile applications, and healthcare systems. It has consistently demonstrated good predictive power and explanatory ability in understanding individuals' technology acceptance and usage behaviors.

#### **2.2.5.1 UTUAT and technology acceptance**

The UTAUT model is a widely recognized theoretical framework used to understand and predict individuals' acceptance and adoption of technology. While the UTAUT model itself does not explicitly address disruptive innovation, it can be applied to analyze the factors influencing the acceptance and adoption of disruptive technologies.

Disruptive innovation refers to the introduction of new technologies or business models that fundamentally transform existing markets or create entirely new ones. Disruptive technologies often offer superior features, lower costs, or improved convenience compared to established solutions. The UTAUT model can be useful in understanding how individuals perceive and respond to such disruptive technologies.

The UTAUT model identifies several key factors that influence technology acceptance:

1. Performance Expectancy: This factor assesses the degree to which individuals believe that using the technology will enhance their performance and productivity. In the case of disruptive innovations, individuals may perceive these technologies as offering significant advantages over traditional solutions, such as increased efficiency or improved outcomes.

2. Effort Expectancy: This factor reflects the perceived ease of use and simplicity associated with adopting and utilizing the technology. Disruptive innovations often aim to simplify processes and provide user-friendly interfaces, reducing the effort required to learn and operate the technology.

3. Social Influence: This factor considers the impact of social norms, peer influence, and subjective norms on individuals' technology adoption decisions. Disruptive technologies may face challenges in terms of social influence, as they are often unfamiliar and may not have established social norms or widespread endorsements from influential figures[69].

4. Facilitating Conditions: This factor examines the availability of resources and support necessary for technology adoption. Disruptive innovations may require changes in infrastructure, training programs, or additional complementary technologies. The presence of facilitating conditions can greatly influence the adoption of disruptive technologies.

5. Hedonic Motivation: This factor relates to the pleasure and enjoyment individuals derive from using the technology. Disruptive technologies often aim to provide novel and exciting experiences, which can contribute to their adoption by appealing to users' hedonic motivations.

By considering these factors within the UTAUT model, researchers and organizations can assess the acceptance and adoption potential of disruptive technologies. Understanding individuals' perceptions, motivations, and concerns can help identify strategies to promote and facilitate the adoption of disruptive innovations, both among individual users and within organizations[56].

It's important to note that the UTAUT model is a general framework and may require adaptation or augmentation to account for specific aspects of disruptive innovation. Additionally, disruptive technologies often face unique challenges related to market disruption, regulatory hurdles, and customer resistance. Therefore, a comprehensive analysis of disruptive innovation would incorporate additional frameworks and models that address these specific aspects [62].

## **2.4 Nature of innovation**

Researchers have proposed various classifications of innovation: 1) Administrative versus Technical Rational Plan versus Communication web versus structured problem-solving [71] [72] Discontinuous versus continuous [73] [74]; 3) competence enhancing versus competence degrading [75] based on the impact of innovation on a firm's competencies; and 4) radical versus incremental [70][76][71][77]–[80] based on the intensity of technological change. The last classification, radical innovation vs incremental innovation, has recently garnered significant attention from scholars focused on organizational learning and dynamic capability [81].

Innovation is an effective method for cultivating dynamic capabilities by fostering ongoing alterations in products and processes to achieve sustained competitive advantage. Innovation is characterized as a novel technology or amalgamation of

technologies that provide significant advantages. The innovation process delineates the trajectory of converting new and/or existing knowledge into commercially viable solutions.

[78] asserts that if a company progresses marginally quicker than its competitors in incremental enhancements, it would seem to possess more advanced products using newer technology, despite all firms utilizing the same amount of technological expertise. These reasons are corroborated by [75], who asserts that the sentiments are more authentic, particularly when all firms involved are striving to enhance the same fundamental design or production process. Nonetheless, [44] and [82] have demonstrated that the emergence of a novel technological ensemble, or ladder, is characterized by an influx of new competitors into the industry. For a corporation to maintain success, it necessitates proficiency in managing rare discontinuities, alongside adeptness in addressing ongoing competitive and client needs for swift incremental enhancements. How can companies maintain success in the face of frequent changes in the technologies that underpin their goods and markets?

Even the most substantial and robust companies encounter difficulties with this. IBM, as noted in [83], has consistently lagged three to eleven years behind in each instance of revolutionary transformation. Digital outpaced IBM by 11 years in launching the minicomputer, Apple surpassed by four years in releasing the personal computer, Apollo was five years in advance with the engineering workstation, Toshiba led by five years with the PC-compatible laptop, and Sun Microsystems was three years ahead with its Sun 4 RISC workstation [46]. IBM's delayed launch of RISC is particularly concerning, given that it was evidently years ahead of its competitors in developing and promoting RISC technology within its corporate

laboratory. Although IBM is again earnestly pursuing entry into the market for massively parallel supercomputers, its newest competitors have once again gained a significant advantage of five or more years. The success and dominance of large enterprises evidently render them susceptible to new market entrants. Former chairman John Akers suggested that dividing IBM into smaller, more manageable entities may effectively mitigate complacency and enhance the market responsiveness of each segment. [84]

Companies that engage in a successful innovation process possess a critical advantage: they have meticulously crafted the trajectory of an idea from conception, through development, to market introduction [85]. The innovation process include radical, incremental, novel, discontinuous, and imitative innovations, in addition to architectural, modular, enhancing, and evolutionary developments [86]. Normative strategies have been proposed for each form of innovation based on robust empirical evidence.

#### **2.4.1 Radical innovation**

The establishment of new enterprises and product lines founded on groundbreaking inventions, essential for revitalizing a firm's competitive stance, necessitates management methods that significantly diverge from those needed for incremental innovation. Radical product innovations entail the creation or implementation of radically new technology or concepts into markets that are either nonexistent or necessitate substantial behavioral changes to current markets, in contrast to incremental innovations, which usually involve logical and relatively minor extensions to current processes or additions to existing products [13,17].

[70] directly associate the degree of radicalness of an invention with the characteristics of the foundational ideas of the innovative process, as well as the degree to which the innovative activity relies on codified information or intrinsically tacit knowledge[87]. Information denotes codifiable facts, with valuation remaining relatively consistent among various agents, employees, and hierarchical levels of decision-making inside the company. Innovative endeavors grounded in economic knowledge are typically incremental, as they usually require organizational consensus over the prospective value and influence of the innovation [88]. Consequently, incremental innovation typically reinforces and improves the existing organizational structure.

Radical innovation relies on information encompassing implicit concepts that resist codification, possess unclear economic value, and typically lead to transformative innovations. The anticipated value of any novel concept is significantly unclear and exhibits a far higher fluctuation than that associated with innovative endeavors grounded in evidence. In the realm of radical innovation, ambiguity exists over the feasibility of producing the new service, the methods of production, and the potential demand for the envisioned product or service.

Moreover, novel concepts comprising tacit knowledge are generally linked to significant asymmetries [90]. To assess a proposed biotechnology product, the decision maker may require not just a PhD in biotechnology but also expertise in the specific scientific domain. Variations in education, background, and experience can lead to discrepancies in the anticipated value of a new project or differences in the expected outcomes from pursuing that idea, resulting in divergent recognition and assessment of opportunities among economic agents and decision-making hierarchies

[91]. The disparity in the assessment of novel concepts will intensify if the new idea contradicts the fundamental competencies and technological trajectory of the established organization. Consequently, radical innovation often disrupts the existing organizational structure and strategic approach of the firm [92].

#### **2.4.2 Incremental innovations**

Incremental innovations enhance or maintain value by refining existing products and services. These incremental modifications may arise from shifting client demands or originate from concepts developed in research laboratories or other sources. The majority of product and service innovations are incremental. Incremental enhancements augment the efficiency and efficacy of current processes and procedures [93]. They focus on enhancing existing business and management processes, including planning, design, manufacturing, production, marketing, administration, supply chains, and communications.

Research indicates that securing support for radical initiatives in major corporations is frequently challenging, as corporate cultures and forces tend to favor low-risk, immediate-reward, and incremental undertakings. Notably, our understanding of good management in the radical product development process is significantly less comprehensive than in an incremental environment. [73]

Continuous innovation is fundamentally an interdisciplinary area of study. It is the continuous activity of managing and enhancing existing configurations, as well as creating and implementing new configurations of products, market strategies, processes, technologies, competencies, and organizational and management systems. In essence, CI represents the continuous interplay among operations, incremental

enhancement, learning, radical innovation, and strategy, with the objective of efficiently integrating operational efficiency, innovation, and strategic superiority, or exploitation and exploration.

Companies mostly concentrate on incremental innovation to maintain their short-term financial objectives. The research emphasis on firms' innovative endeavors has predominantly centered on developed markets, where institutional support mechanisms, including financial intermediaries and information analysts, are robust. In contrast, emerging markets exhibit underdeveloped institutional frameworks, with government intervention significantly impacting resource allocation and, consequently, firm operations. Incremental innovation is essential for enhancing firm performance and achieving competitive advantage in service organizations [96]. Incremental innovation signifies a minor deviation from established processes and technologies, which are typically routine and functional. The ability to network politically can provide enterprises with a competitive edge in their innovative endeavors by securing advantageous finance and tax policies from the government.

The implementation of effective innovation has emerged as a significant strategy for obtaining a competitive edge within an organization [97]. When a new feature is added, removed, or replaced without altering the entire range of goods and services, incremental innovation takes place with the primary goal of overcoming intrinsic ambiguity [98]. Enhancing performance, quality, and usefulness through incremental improvements to current products, services, and organizational procedures is essential for creating more competitively advanced goods and services [99]. The firm will undoubtedly gain a competitive edge from this innovation, which is more likely to

enhance and expand the quality and added value of present products and meet the needs of current customers [100].

### **2.4.3 Discontinuous innovation**

To exemplify the concept of discontinuous innovation: in the 1880s, a prosperous industry existed in the northeastern United States focused on the profitable trade of ice. The business strategy was ostensibly straightforward: labor diligently to extract sizable blocks of ice from the frigid northern regions, promptly package the harvest, and expedite its shipment to the warmer southern states—and increasingly abroad—where it could be utilized for food preservation. During its peak, this sector flourished, with a record harvest of 25 million tons in 1886, employing thousands in the cutting, storage, and transport of the product. The industry demonstrated a robust commitment to innovation, with advancements in ice cutting, snow ploughs, insulation techniques, and logistics driving significant growth.

Simultaneously, at many laboratories worldwide, researchers such as the youthful Carl von Linde were addressing the nascent challenges of refrigeration. Artificial ice production soon materialized, and by 1873, a patented commercial refrigeration system was available for purchase. In the subsequent years, the sector expanded; in 1879, there were 35 plants, and a decade later, 222 facilities produced artificial ice. This breakthrough effectively marked the conclusion of the ice harvesting sector, but for a period, both industries coexisted, learning, inventing, and collectively extending the overall ice market. The ice harvesting sector was ultimately supplanted by the refrigeration industry, which was dominated by new entrant firms.

This pattern of extended invention periods under stable conditions, interspersed with significant shifts, is prevalent. Let us advance to the latter part of the 20th century and examine a markedly distinct industry – the computer disk drive sector. Similar to the ice industry, it was a flourishing sector where the insatiable demands of the expanding mini-computer industry for robust computers in engineering, banking, and other fields created a lucrative market for disk drive storage devices. Companies in the sector collaborated intimately with their clients, comprehending the specific requirements and expectations for increased storage capacity, expedited access times, and reduced physical dimensions, among others. All was OK until a sudden disruption destabilized the smoothly operating industry.

The significant change was not attributable to technology but was instigated by the advent of a new market with markedly different expectations. While the mini-computer sector prioritized high performance and technologically advanced storage devices, the nascent market for personal computers exhibited a markedly different configuration. These machines were significantly less sophisticated, capable of executing considerably simpler software and exhibiting markedly worse performance, yet available at a price accessible to a distinctly different demographic. Significantly, despite their simplicity, they were proficient in doing the majority of fundamental activities that a broader market sought, including basic mathematical computations, word processing, and elementary graphics. As the market for these expanded, the learning effects resulted in enhanced capabilities, although from a significantly lower cost foundation. This transition impacted both the manufacturers of the new personal computers and the emerging companies that provided them with more affordable and simplified disk drives. Ultimately, a similar pattern emerged as observed in the ice industry, albeit from an other perspective. Among the prominent manufacturers in

the disk drive sector during the 1990s, only a few endured, and dominance in the emerging market transitioned to new entrant companies employing a markedly different approach. [21]

These instances are not isolated but representative of a broader pattern in innovation. Consider the transformation in aviation that low-cost carriers have initiated. The difficulty emerged from a novel business model rather than technological innovation, predicated on the assumption that maintaining low pricing might unlock a substantial new market. To ensure low prices were profitable, several issues had to be addressed: maintaining high load factors, reducing administrative expenses, and facilitating swift turnaround times at terminals. However, once the model proved effective, it drew not only new customers but also seasoned travelers who recognized the benefits of reduced fares.

#### **2.4.4 Architectural Innovation**

Architectural innovation alters the product configuration and integrates components in novel manners without introducing fundamentally new component technologies [101]. It transpires when pre-existing information or hardware included into a product is reconfigured, resulting in an entirely distinct product and potentially a new market. The product's function rarely undergoes significant alteration [102]. In architectural innovation, corporations frequently have the challenge of extracting excess from existing technology, which is currently their primary revenue source, while also investing in new technology. It is accurate that senior management is not accountable for the success or failure of AI; but, they must allocate the necessary funds as required by technical personnel. AI is supported by a substantial portfolio of proprietary patents. Architecture I: 'resources and strategy centric' (investment center) as

substantial resources will be allocated; thus, we will ascend the technological S curve significantly earlier, securing a considerable advantage subsequently.

Established organizations confronting architectural innovation have two primary challenges. Initially, architectural innovation can often be integrated into existing models, creating a challenge in distinguishing a specific invention as architectural. Secondly, architectural innovation undermines the efficacy of established communication routes, information filters, and problem-solving procedures inside engineering companies [70]. Long-standing organizational systems that once made up the firm's core competencies become fundamental impediments to innovation [104], [105].

#### **2.4.5 Modular Innovation**

A modular system is characterized as a complicated entity, wherein each component is designed individually yet operates cohesively as a unified whole. [106] Modularity denotes the presence of modules (subcomponents of the entire system) that, when integrated via well specified interfaces, accomplish a comprehensive function.

A modular system's antithesis is a flawlessly integrated system, which cannot be readily disassembled into independent subsystems. This notion of modularity is evidently based on the "loosely-coupling" methodology established by [107]. A modular system comprises two components: modules (subunits of the system) and an interface that facilitates the linking of the modules.

The objective of a modular system is to establish an interface that reduces interdependencies among modules executing distinct functions. This essential issue is presented by [108] "Modularity does not pertain to disassembling a system into

components.” All systems are composed of components. Modularity pertains to the organization of components and the interactions and communications between groups of these components.

Modularity can be evaluated at three levels: technical, organizational, and cognitive. Firstly, modularity can address the technical architecture of items. This viewpoint, initially articulated in the seminal work of [109], has been the most extensively examined by scholars. Technical modularity denotes the capacity to disassemble a product into autonomous sub-products that can subsequently be reassembled in various configurations. Secondly, organizational modularity denotes a certain form of labor division and specialization.

It posits horizontal ties among workers linked to a standardized platform, in contrast to hierarchical organizations founded on vertical relationships. Additionally, cognitive modularity pertains to the segmentation of knowledge. It denotes the potential to decompose the information required to design, construct, and market a product into discrete components.

Cognitive modularity presents challenges regarding communication and language for knowledge transfer. In instances of stabilized technologies, the three types of modularity often converge, as technological modularity can influence both organizational and cognitive modularity.

The current competitive environment is defined by systemic technologies and diminishing product life cycles, driven by swift technical advancements and rapidly evolving client needs. In response to these dynamics, corporations have shown a

growing interest in modularizing their goods, production processes, and organizational frameworks.

In modular innovation (MI), the core company is required to retain only those technologies essential for system performance, while the remainder is typically outsourced [1]. The core company must guarantee sufficient redundancies in the system, allowing a module to be supplied by multiple sources, even if any single supplier engages in opportunistic behavior. MI possesses a significantly smaller quantity of in-house patents in comparison to AI. Modular innovation alters simply the fundamental design concept without modifying the entire product architecture (MI) [94].

A specific issue of modular innovation is to reconcile the often protracted duration of technological development with the exigency for a rapid market introduction of new products [110]. A prevalent solution to this issue in the automotive sector is "advanced engineering," wherein novel component technologies are developed beforehand and stored in a "refrigerator" for later selection by engineers engaged in commercialization initiatives. The development engineers adapt the new technology to suit the unique product. Novel component technology may be comprehensively shown, evaluated, and validated prior to its transition to commercial product development. A certain technology maturity level, referred to as the "technology feasibility point," may be designated to ensure that new technologies are not transmitted prematurely. Technological advancement is not only distinct from product development in terms of organization but also in temporal aspects. Consequently, significant technological uncertainty is mitigated in product development initiatives aimed at commercialization.

Modularity is seen as a crucial success element in numerous markets, since it facilitates the rapid development and production of a range of varied products at reduced costs. Products consisting of modules with standardized interfaces enable manufacturers to customize offerings at minimal expense, while buyers can enjoy the advantages of tailored products at comparatively affordable rates. Black & Decker power tools, Hewlett Packard Deskjet printers [111], and Microsoft Windows [37] are a few examples of successful modular product platforms. However, enterprises beyond high-tech manufacturing sectors, such as the computer industry, also face challenges in effectively catering to their changing consumers. Moreover, conventional sectors such as the construction industry, which were anticipated to be steady, face difficulties in bridging the gap between their loosely integrated, vertically specialized outputs and the evolving demands of the environment.

## **2.5 Emerging disruptive innovations**

Disruptive innovations convert non-consumers into consumers. This section discusses many technical advancements that can be categorized as disruptive innovations. Disruptive innovation originates from a distinctly different paradigm. These advances can grant a previously excluded demographic of consumers access to products or services that were formerly accessible only to a select few. For instance, in Africa, mobile banking services such as MPesa [113] offer a cost-effective and straightforward branchless banking solution to a populace that had previously been significantly underserved by traditional banking institutions. Numerous instances of disruptive innovation have been documented in recent decades, encompassing personal computers and small steel mills. Firms that spearhead disruptive innovations

frequently come to dominate the industries they penetrate. Several nascent disruptive ICT innovations encompass:

### **2.5.1 Cell phones**

In the initial era of mobile devices, "adequate" signified a bulky apparatus, frequent call dropouts, subpar audio quality, limited battery longevity, and elevated expenses. Nonetheless, these cumbersome cell phones provided the transformative benefit of mobility [4]. As technology advanced, these performance trade-offs gradually diminished. With the evolution of the cost/performance curve, adoption patterns shifted, leading to cell phones supplanting numerous landlines and surpassing PCs as the preferred technology for the majority of users [114]. By 2010, the global mobile phone count exceeded 5 billion, quintupled compared to the number of personal computers.

### **2.5.2 Mobile Banking**

One of the most notable examples of disruptive innovation "made in Africa" is the mobile payment system M-Pesa, which facilitates the "banking of the unbanked"[37]. The service, initiated by Kenyan mobile provider Safaricom, enables users to perform financial transactions through their mobile phones without requiring a bank account. At the time of M-Pesa's inception in 2007, the formal banking industry catered to slightly more than 25% of Kenya's adult population.

The entire country possessed merely 450 bank branch offices, amounting to fewer than two branches per 100,000 individuals. Currently, every little kiosk, bar, and business possesses an M-Pesa number, allowing customers to transact for items and services using their mobile phones. In a metropolis such as Nairobi, individuals utilize

M-Pesa not only for its convenience but also for its security and its ability to mitigate the need to carry substantial sums of cash. The service is user-friendly: an individual deposits cash into their M-Pesa account and subsequently transfers those funds to another user's M-Pesa account. Funds can be disbursed by a transaction code at any of the more than 35,000 M-Pesa agents nationwide. Currently, more than 15 million Kenyans using M-Pesa, with over 20 percent of the nation's GDP transacted via the platform.

### **2.5.3 Cloud Technology**

Cloud technology enables the delivery of any computer program or service via a network or the Internet, necessitating little to no local software or computing resources. To do this, IT resources, including computation and storage, are provisioned on an as-needed basis; additional capacity is seamlessly integrated without necessitating upfront investment in new hardware or software development [116].

The cloud facilitates the rapid expansion of Internet-based services, encompassing search, streaming media, offline storage of personal data (such as photos, books, and music), and the background processing functions that allow mobile Internet devices to execute tasks like responding to voice commands for directions. The cloud can enhance the economic efficiency of IT for corporations and governmental entities, while simultaneously offering increased flexibility and responsiveness. Finally, a variety of pay-as-you-go service models are among the completely new business models that the cloud can facilitate [117].

### **2.5.4 Autonomous Vehicles**

It is already feasible to manufacture vehicles, including cars, trucks, aircraft, and boats, that are fully or partially autonomous. The technologies of machine vision, artificial intelligence, sensors, and actuators that enable drone aircraft on the battlefield and Google's self-driving automobile are advancing rapidly. In the next decade, affordable, commercially accessible drones and submersibles may be utilized for various applications. Autonomous vehicles may facilitate a transformation in terrestrial transportation, contingent upon regulatory approval and societal acceptance. Additionally, devices that aid drivers in steering, braking, and collision avoidance provide considerable utility. Autonomous vehicles, including cars and trucks, provide prospective advantages such as enhanced safety, diminished CO2 emissions, additional leisure or work time for drivers through hands-free operation, and heightened productivity within the trucking sector.

### **2.5.5 Mobile Internet**

In an impressively brief period, Internet-enabled portable devices have evolved from a privilege accessible to a limited demographic to a fundamental component of everyday life for more than one billion individuals who own smartphones and tablets. In the United States, around 30 percent of web browsing and 40 percent of social media interaction takes place on mobile devices; forecasts suggest that by 2015, the usage of wireless web will exceed that of wired connections [119].

The pervasive nature of connectivity, coupled with the rapid expansion of applications, is facilitating novel approaches for individuals to navigate their daily lives, enhancing their understanding, perception, and interaction with the tangible environment. The evolution of mobile Internet technology is proceeding at an impressive pace, characterized by increasingly intuitive interfaces and innovative

formats, such as wearable devices. The mobile Internet presents a myriad of applications within both the corporate sphere and the public sector, facilitating more efficient service delivery and fostering opportunities for enhanced workforce productivity. The mobile Internet has the potential to link billions of individuals in underdeveloped nations [116].

### **2.5.6 Advanced Robotics**

Over the course of the last several decades, industrial robots have assumed roles that are physically demanding, hazardous, or unclean, including tasks such as welding and spray painting. These robots have proven to be costly, cumbersome, and rigid, affixed to the ground and enclosed to ensure the safety of workers. Currently, sophisticated robots are acquiring improved sensory capabilities, dexterity, and cognitive functions, driven by rapid progress in machine vision, artificial intelligence, inter-machine communication, sensors, and actuators [120].

These robots may facilitate a more straightforward programming and interaction experience for workers. They possess a greater degree of compactness and adaptability, thereby facilitating their safe deployment in conjunction with workers. The recent developments may render it feasible to replace human labor with robots in an increasing array of manufacturing tasks, alongside a rising number of service occupations, including cleaning and maintenance. This technology has the potential to facilitate the development of innovative surgical robots, advanced robotic prosthetics, and exoskeleton braces designed to assist individuals with limited mobility, thereby enhancing their functionality and contributing to the improvement and prolongation of life [121].

### **2.5.7 Knowledge work Automation**

Recent developments in artificial intelligence, machine learning, and natural user interfaces, such as voice recognition, are enabling the automation of numerous tasks traditionally deemed unfeasible or impractical for machines to undertake within the realm of knowledge work. For example, certain computers possess the capability to respond to “unstructured” inquiries (that is, questions articulated in everyday language, as opposed to being meticulously formulated as software queries), thereby enabling employees or customers lacking specialized training to independently access information [122].

This presents opportunities for profound transformation in the organization and execution of intellectual labor. High-skilled workers' abilities can be enhanced by sophisticated analytics tools, and there's a chance that some job types may eventually become entirely automated as more knowledge worker activities can be completed by machines [91].

## **2.6 Existing innovation models**

This research considers two pertinent innovation models: the theory of disruptive innovation, which was proposed and developed by [21], and the disruptive Model as suggested by [44].

### **2.6.1 Model for disruptive innovation**

This model was conceived by [7] to facilitate the examination and comprehension of transformative shifts, particularly within the context of entire industries. This research sought to establish conceptual definitions, a stratified model, and a classification of

strategies designed to address various forms of disruption. This model's central perspective integrates technology, business, and consumer behavior.

The primary advantage of the definitions articulated in this research lies in their applicability, regardless of the specific characteristics and dynamics of a disruption. The definitions are applicable across any layer of agents. The spectrum encompasses scientific inquiry to the regulatory frameworks established by governing bodies within society. Scientific disruptions, often referred to as paradigm shifts, may manifest within the realm of science; the discovery of the theory of evolution serves as a prominent illustration. The continuous accumulation of scientific knowledge facilitates technical innovations within the research and development (R&D) sectors of both private enterprises and public institutions, even in the absence of a paradigm shift or significant disruptors. At this level, numerous significant decisions are undertaken by middle managers who initially discern the potential of an invention. Consequently, a manager has the potential to act as a catalyst for change within an organization by reallocating resources from outdated technologies to foster the development of a commercially viable invention, which constitutes an innovation [123].

At the organizational level, the principal decision-maker responsible for introducing an innovation to the market is the Chief Executive Officer, in collaboration with other senior management personnel. Within an organization, transformative technologies generally necessitate the acquisition of new competencies and instigate a compelling impetus to evolve the firm's value creation frameworks. Disruptions arise from the integration of a well-established technology into a different business sector or through

the innovative amalgamation of two or more existing technologies, as elaborated in [43].

The ramifications of disruptions can permeate various strata, encompassing technology, business, and consumer behavior, as elucidated in [40]. A disruption initiated by an emerging technology influences the value creation framework of a company, enabling it to introduce innovative products. The new product may traverse the industry layer without exerting any immediate disruptive influence on the overall industry architecture. Nonetheless, should the product generate considerable demand among consumers, the initial technology push may evolve into a market pull, leading to a disruption that reverberates throughout the industry and organizational structures, yielding significant repercussions. For instance, the adoption of short message service (SMS) by consumers occurred at a pace significantly faster than anticipated by the service providers [124]. The advent of SMS highlighted a pressing demand for online social interaction, which subsequently catalyzed the emergence of social media applications.

At the foundational levels of science, research and development, and industry, one can frequently pinpoint the disruptor—an individual or a collective—who catalyzes a disruption through the introduction of a novel publication, patent, or product [78]. The significance of a disruption can be assessed through these accomplishments. The circumstances at the higher strata are less clear-cut. Within the industry layer, the introduction of new products has the potential to alter the configuration of value networks. Disruptions influence an industry by altering the dynamics among various stakeholders, leading to mergers, acquisitions, and bankruptcies that serve as indicators of the magnitude of a disruption [125].

The Disruptive Innovation Model possesses numerous strengths, notably its well-defined framework that elucidates the mechanisms through which emerging technologies can challenge and transform established markets and enterprises. It adeptly elucidates the distinctions between sustaining and disruptive innovations, enabling organizations to discern potential threats posed by emerging competitors. The model underscores the significance of comprehending customer requirements and market dynamics, which can inform strategic decision-making. Nonetheless, it possesses certain shortcomings as well. A significant constraint lies in its potential to reduce intricate market dynamics and the diverse aspects of innovation to overly simplistic terms. Moreover, the model frequently emphasizes technology-driven disruptions, possibly overlooking other essential elements such as organizational culture, leadership, and external environmental factors that can significantly impact innovation outcomes. Moreover, it may not adequately consider the distinct contexts of various industries, potentially resulting in difficulties when attempting to apply the model universally across a range of sectors.

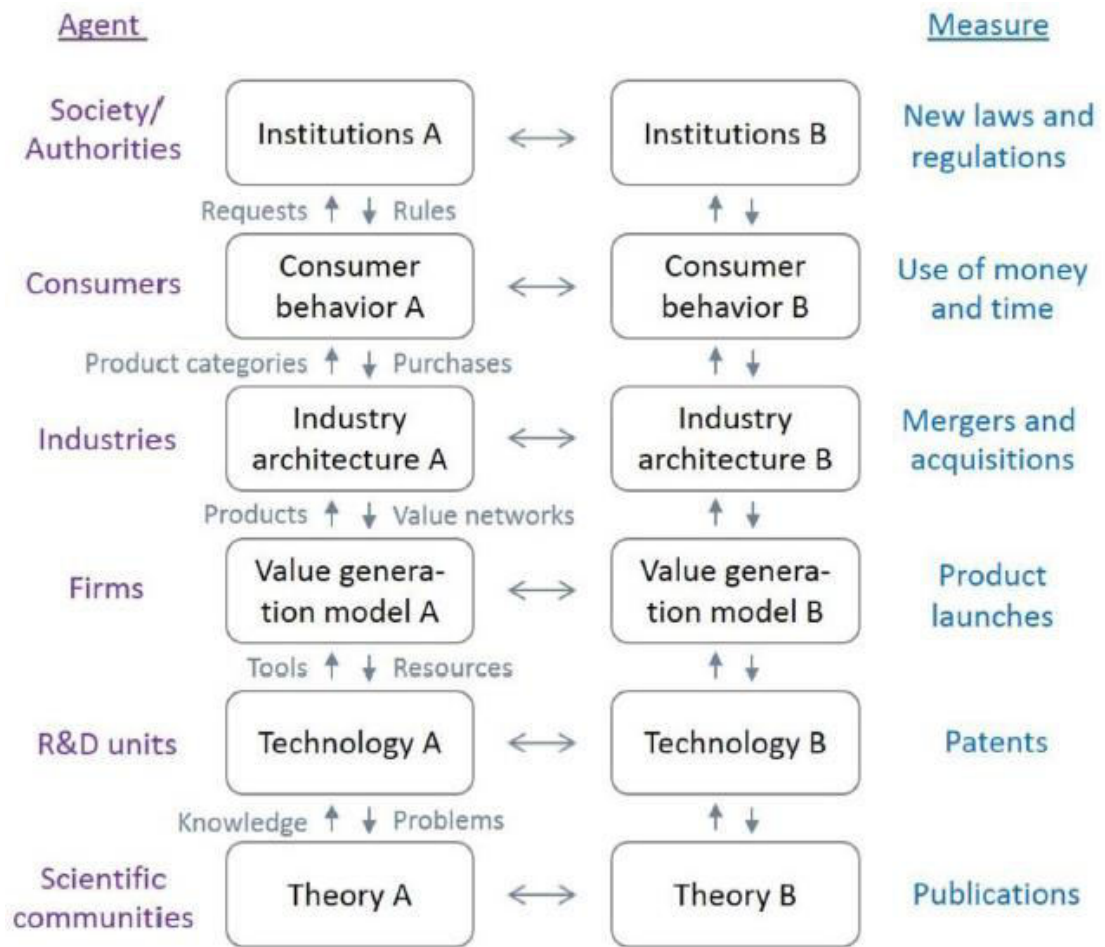


Figure 2.2: Theory of disruptive innovation. Adopted from [44]

## 2.6.2 The Innovator's dilemma

This topic is approached as a theoretical framework and a model, as the fundamental premise of the theory seeks to elucidate the trajectory of disruptive innovations. The concept of disruptive innovation was introduced by [21]. Similar to other management theories, the concept of disruptive innovation originated from a keen observation that led to a more expansive research inquiry. In various sectors, including technology, commerce, and manufacturing, prominent companies have struggled to maintain their dominance within their markets. Remarkably, these

ostensibly well-managed firms received considerable acclaim from analysts and the business media; however, they overlooked a critical factor that led to their downfall. Furthermore, despite the dominance of explanations based on organizational inertia, managerial cognition, and technological complexity [126][127][16], the observation prompted a completely new model and research program that aims to explain the challenges faced by top firms in the face of specific technological and market changes.

To explore the factors contributing to failure, [21] initially scrutinized the hard disk drive industry. The findings of his comprehensive study revealed that when a novel innovation surfaced, enhancing performance on dimensions traditionally esteemed by customers (such as the capacity and recording density of disk drives), established players typically spearheaded commercialization efforts and preserved their market dominance. Nonetheless, when an innovation surfaced that did not enhance performance within the established trajectory but rather presented a distinctive array of new product attributes (such as compactness, lightness, and durability), new entrants spearheaded development while established players faltered or succumbed. A comparable trend was noted throughout various technological epochs and product life stages. [91]

The study of the disk drive industry introduced a descriptive model for disruptive innovation, comprising three key components. Initially, in numerous sectors, the speed of technological advancement surpasses the expansion of market demand for superior technologies. Consequently, established firms may exceed market demands by creating overly sophisticated, feature-laden products that surpass customer requirements. This creates a disparity in the lower segments of the market, where the performance expectations of consumers are not met by the offerings of these

companies, thus presenting an opportunity for new entrants targeting the more basic needs of the market. Secondly, for organizations, it is crucial to recognize the strategically significant differentiation among various forms of innovations in technology or business models that arise within an industry. The predominant classifications are identified as sustaining innovations, which enhance products and services in ways that align with the performance metrics valued by mainstream consumers and that have been historically significant in major markets.

They facilitate incumbents in enhancing sales to their most valued existing clientele, achieving elevated margins and increased profitability. The less commonly encountered category of innovations is known as disruptive innovations. ii When disruptive innovations are first presented, they perform worse on recognized performance metrics than incumbent products, but they provide a unique combination of features that appeal to niche markets, like those at the bottom of the market [129] [39].

For instance, they could be more compact, cost-effective, readily available, or easier to use. Third, the presence of existing customers and established profit models limits the capacity of established firms to invest in new innovations. Consequently, investments that may seem unappealing to incumbents could, in fact, present significant opportunities for new entrants who possess few, if any, customers and encounter fewer competing investment options. As a result, established entities often lack the incentive to pursue their own disruptive innovations, which tend to offer reduced profit margins, cater to niche markets, and present products and services that may not meet the needs of their current clientele.

The Innovator's Dilemma possesses several remarkable strengths. A notable strength lies in its capacity to elucidate the reasons behind the failure of successful companies to innovate and adapt to disruptive technologies, even when they possess the necessary resources and capabilities. It adeptly demonstrates the notion of "disruption" and the tendency of established firms to fall into complacency, prioritizing their existing customers and lucrative products while overlooking the evolving trends in the market. This perspective urges organizations to maintain a state of alertness and receptivity to innovative concepts, even when such notions challenge established business frameworks. Nonetheless, the model exhibits certain limitations. A notable limitation lies in its tendency to oversimplify the complexities encountered by established firms, implying that the core issue revolves chiefly around the neglect of disruptive innovations. In practice, organizations frequently encounter intricate dilemmas between immediate financial gains and sustained innovative progress. Furthermore, the model may fail to sufficiently consider the influence of external elements, including regulatory modifications or alterations in consumer behavior, which can profoundly affect a company's capacity for innovation. Ultimately, although it offers significant insights for technology-driven industries, its relevance to other sectors may be constrained, rendering it less universally applicable.

### **2.6.3 Proposed Disruptive Innovation Model**

The proposed Disruptive Innovation Model integrates essential components from the Innovator's Dilemma, the Christensen Disruptive Innovation Model, and other relevant frameworks to provide a thorough comprehension of the disruptive innovation process in the banking sector for Small and Medium Enterprises (SMEs). This paradigm consists of four fundamental components: Innovation characteristics encompass sustaining and disruptive technologies, low-end and new-market disruptions, ease of use, integration, maturity, and diffusion. Organizational factors

include capabilities, resources, processes, financial investments in ICT, technology, personnel, and financial aspects. Environmental factors address the implementation environment, organizational ICT policies, ICT skill levels, market dynamics, target and value markets, cost structure, external influences, government regulations, technological changes, social factors, user satisfaction, and macroeconomic conditions. Finally, moderating variables consist of industry characteristics and competitive dynamics that can influence the outcomes of disruptive innovations. The model clarifies the interconnections among these elements, demonstrating how the features of innovation, organizational preparedness, and environmental context jointly impact the emergence and adoption of disruptive technologies and business models. This comprehensive approach not only deepens the comprehension of complex dynamics but also provides a strategic framework for SMEs and policymakers seeking to adeptly manage and capitalize on disruptive technologies in the constantly changing banking environment.

The Proposed Disruptive Innovation Model diverges from the Christensen Disruptive Innovation Model and the Innovator's Dilemma by providing a more holistic perspective on disruptive innovation. The Christensen model primarily examines the types of disruptions and their impact on established firms, while the Innovator's Dilemma underscores the difficulties encountered by existing corporations in their innovation efforts; this proposed model encompasses a wider array of issues. It examines organizational capacities, environmental factors, and other critical elements that may affect the adoption of innovations. This methodology is especially pertinent for Small and Medium Enterprises (SMEs) within the banking sector, as it encompasses both technological dimensions and the organizational and environmental elements that influence the adoption of these advances. By analyzing the interactions among these aspects, the model elucidates the factors that facilitate or obstruct the effective execution of disruptive innovations, providing essential insights for stakeholders seeking to foster innovation in the swiftly transforming banking industry.

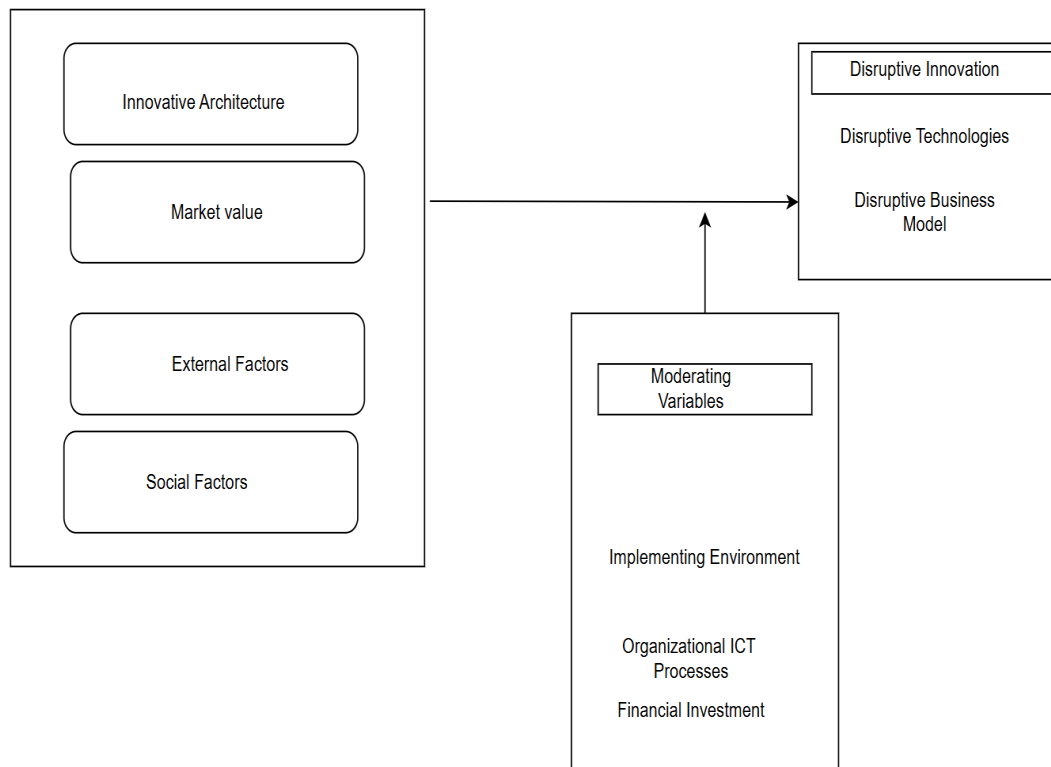


Figure 2.3: Proposed Disruptive Innovation Model

## 2.7 Business model innovations and radical product innovations

Literature discusses two categories of disruptive innovations: business model innovation and radical product innovation. Although both represent disruptive breakthroughs, they present fundamentally distinct difficulties for established organizations and have markedly different implications for managers [124].

### 2.7.1 Business model innovation

Business-model innovation is a form of innovation that often disrupts established competitors. In previous research [49]. He refers to this form of invention as strategic innovation, a word that is ambiguous. Business-model innovation unequivocally embodies the essence of this category of innovation. Business-model innovation

entails the identification of a fundamentally distinct business model within an existing enterprise.

For a new company model to be deemed innovative, it must expand the current economic landscape by either drawing in new customers or prompting existing customers to increase their consumption. The necessity to expand the market indicates that business model innovation transcends only the identification of a groundbreaking approach by a company. Consequently, IBM's strategic shift in the early 1990s, albeit radical, does not constitute business-model innovation. Conversely, businesses like Amazon, Schwab, Dell, Swatch, and Southwest are seen as business-model innovators since they made new business models available in their industries, which drew in new customers [43].

Business model innovators do not create new products or services; rather, they redefine existing offerings and their delivery to customers. For instance, Amazon did not originate bookselling; it redefined the nature of the service, the benefits to the client, and the method of service delivery. Likewise, Swatch did not invent the watch; it reinterpreted the product's essence and the rationale for consumer purchase [40].

[20] indicates that, regardless of whether the disruptive innovation surpasses the existing business model, incumbents must devise a response to it. Nonetheless, a reaction does not inherently imply that adoption is required. They might react to the innovation not by embracing it, but by enhancing their current operations to render the traditional competitive methods more formidable compared to the new approaches. Incumbents has the capability to combat innovators by attempting to undermine the disruptors. The many reaction strategies accessible to established organizations were examined in [130]

### **2.7.2 Radical Product Innovations**

A second category of innovation that often disrupts established companies is radical innovation. Radical product innovation generates novel items, like the automobile, television, personal computers, VCRs, and mobile phones. Radical innovations disrupt customers by introducing products and value propositions that significantly alter established consumer routines and behaviors. They disrupt producers by creating marketplaces that undermine the competencies and complementary assets upon which existing competitors have established their success. Due of their disruptive nature towards both consumers and producers, these innovations are seldom propelled by demand. Rather, they arise from a supply-push mechanism initiated by individuals tasked with advancing new technology [24].

It is ironic that, in numerous instances, a latecomer dominates the market despite offering an inferior product compared to those of the early innovators. This occurs for two reasons. Initially, due to the endeavors of the early pioneers, the new product enhances its performance to levels that either meet or exceed client requirements. Any more expenditures to enhance the product's performance are not really required at that point [81].

However, the early pioneers are unable to restrain themselves: Their engineering cultures engage in their tasks, resulting in an increasing allocation of funds towards research and development (R&D) to enhance the product and expand its usefulness. All of this transpires despite the complete understanding that their consumers neither require nor will ever utilize the additional features. Product over-engineering is

associated with a subsequent transformation occurring: Additional expenditures and enhancements to the product's performance incur costs. Consequently, escalating expenses result in increased prices [11]. The elevated cost consequently restricts the appeal of the device to a niche demographic of technology aficionados and early adopters.

The interplay of these two elements provides latecomers the opportunity to penetrate the market and usurp it. They understand that their sole requirement is to manufacture a product that offers satisfactory performance while being more economical than current market offerings. Their goods may not match the quality of the pioneers' offerings, although this is of little consequence. The early adopters are not drawn to these substandard products; but, the general buyer is. For them, this product is satisfactory and economical [131]. Eventually, the consolidators may enhance their product's performance to a degree that even technically proficient clients find them appealing, leading to a potential move. Nonetheless, this is not entirely essential. Provided they dominate the mainstream market, the consolidators are content to provide a few minor niches for other competitors to exploit. Their primary goal is to provide a product that is not necessarily the finest, but rather one that is sufficiently performant and competitively priced..

## **2.8 Factors influencing the success of ICT innovations**

Innovation models have served as benchmarks for assessing the efficacy of diverse inventions. Innovation models are defined as the assessment of activities, processes, outputs, or resources commonly included in every quality improvement plan [132]. IT models specifically embrace a technology management approach by implementing a foundational principle inside the IT function: effective management necessitates

initial measurement [133]. IT models facilitate project estimation, evaluate the progress and performance of IT personnel and routine IT operations, analyze software quality, among other functions. Any IT process that aligns with the organization's objectives and requires evaluation can be quantified and governed through models [100].

An IT model quantifies the activities of a process, individual, or product through a predetermined measurement method. IT models are basic calculations or formulas designed to quantify and oversee IT activities such as software development, application maintenance, production operations, security, and personnel ratios.

A contributing factor to the policy attention gap is the absence of models that effectively characterize the nation's innovation ecosystem and the interrelations among numerous features, ranging from knowledge inputs to transformation processes to final results.

As enterprise technology advances, the necessity to assess and regulate IT quality and efficacy also increases [136]. Due to internal and external business factors, models are increasingly utilized as efficient management tools to sustain and enhance IT quality and efficiency [137].

As with any IT project, models must be meticulously defined, gathered, tested, and implemented [138]. This indicates a cyclical methodology that includes feedback, evaluation, communication, and change management [139]. The essential factor for the effective implementation of IT models is the selection of an appropriate model for adoption and the ongoing enhancement of the instruments utilized in the development and sustainability of innovation [140].

The success of ICT innovation depends on the interplay of technological capability, organizational readiness, financial investment, market demand, and policy environment. While financial investments provide the necessary resources for scaling innovations, organizational processes determine the efficiency and adaptability of deployment. Financial inputs relate to resource allocation, whereas organizational processes involve structures, routines, and culture that sustain innovation implementation.

### **2.8.1 ICT innovation architecture**

An extensive body of theoretical literature has emerged regarding the innovation potential of ICT. Literature suggests that ICT possesses significant potential to serve as both an enabler and a catalyst for innovations that enhance performance in processes and products [141] [142]. It underscores that the majority of current work practices and business processes within organizations have their roots in historical developments, significantly shaped by the rationale of manual labor and the substantial expenses associated with communication and information processing during that era [143]. Nevertheless, information and communication technology has significantly diminished these expenses, paving the way for improved business processes and work practices that result in substantial productivity gains. This is accomplished first by lowering costs and enhancing output quality, and subsequently by innovating new products and services while refining essential intangible elements of existing offerings, including convenience, timeliness, quality, and personalization.

ICT can significantly restructure work practices by transferring well-defined routine tasks related to symbol processing to computers and transforming tasks that require human skills [16]. It can also change how human work is performed, measured,

controlled, and reported. Furthermore, information and communication technology empowers individual workers by providing them with the necessary information to manage larger segments of the processes they engage with. This capability can significantly diminish the existing fragmentation of numerous processes, leading to substantial enhancements in efficiency [76]. [81] outlines nine fundamental approaches to employing ICT in the facilitation of process innovations: automation, informational, sequential, tracking, analytical, geographical, integrative, and disintermediation.

[118] posits that ICTs hold significant potential for markedly enhancing not only the internal operations of firms but also the dynamics of transactions and collaboration with their customers, suppliers, and partners. The significant capacity of ICT to foster innovation is closely linked to their classification as 'general purpose technologies.' This designation is marked by a high degree of flexibility and adaptability, allowing for diverse applications across various contexts and objectives, thereby facilitating crucial advancements in business processes, products, and services within organizations [127].

[23] cautions that the innovative potential of ICT is not predetermined, but is significantly influenced by the surrounding context; ICT has the capacity to foster new technology-mediated organizational practices, which are largely molded by the social, organizational, and national environments in which they are conceived and employed. Consequently, identical ICT can be utilized in markedly diverse manners across various contexts, leading to a range of distinct outcomes.

## **2.8.2 Legal and regulatory models**

The expansion of the ICT sector across the globe has been remarkable, particularly following the broad accessibility of the internet in the 1990s. Countries have recognized the significant role that information and communication technologies can play in fostering growth and development. Consequently, they are diligently working to integrate ICT into national policies as a fundamental aspect of their development objectives. A multitude of developing nations, particularly those in sub-Saharan Africa, have implemented diverse strategies to tackle developmental challenges with the aim of enhancing the quality of life for their populations. Data from developed nations and Newly Industrialised Countries (NICs) indicate that information and communication technologies (ICTs) can effectively aid in alleviating poverty and fostering development by generating employment opportunities, boosting economic activities, lowering production costs, enhancing service delivery quality, and promoting decentralised growth and development [50].

The advancement of information and communications technologies (ICTs) facilitates the electronic, instantaneous, and global communication and transactions between businesses and individuals. This engenders a multitude of legal and regulatory challenges for policymakers, encompassing the legitimacy of electronic contracting methods and the associated security risks, as well as apprehensions regarding cybercrime and the safeguarding of intellectual property rights in the digital realm.

Translating policy objectives into practical laws and regulations is undoubtedly a complex endeavor across various fields; however, technology introduces unique challenges for legislators, chiefly because of the rapid evolution inherent in the subject matter, such as software, computers, and networks, as well as the ways in which this technology is employed. The boundaries of our creativity are evident not only in our

lack of understanding regarding the trajectory of technological advancement but also in our perceptions of its adoption by users [81]. A considerable body of literature has explored the characteristics of regulation within a context characterized by pervasive information, computing technologies, and interconnected networks. In light of the challenges faced, policymakers have endeavored to identify foundational principles that may inform regulatory initiatives within the domain [39].

The foremost and frequently referenced regulatory principle is that of “technology neutrality.” Policymakers frequently invoke the notion of “technology-neutral” regulation, acknowledging the swift evolution of the environment that renders it impractical to anchor legal frameworks to specific technologies or market models [144]. The principle, along with its variations, has been applied in two fundamental ways: first, that which is regulated offline ought to be subject to similar regulation online; second, the necessity to address different technologies in a comparable manner, provided they yield analogous effects. Nonetheless, there are ongoing debates regarding the application of the principle in the context of substantive law and procedural law reform [50].

### **2.8.3 Implementation environment**

The vision and policy of a company exert a significant impact on the strategic adoption and implementation of ICT within a construction organization [145]. The organization's vision serves as a foundational strategic aim for the long-term adoption of information and communication technology, while its policy facilitates the implementation of such technology by establishing a framework for employee conduct. The endorsement of top management is crucial in the decision-making process regarding ICT adoption, as such support is fundamental for the advancement

of both infrastructure and personnel necessary for the successful integration of ICT within the organization.

The initial adoption driver cycle of the ICT initiative is instigated by the organization's policy regarding the enhancement of fundamental ICT competencies [82]. An individual of distinction will arise, exhibiting diverse levels of fervor and impact within the institution. Prominent technological custodians within the organization facilitate the dissemination of knowledge to prospective ICT users. They additionally evaluate communications regarding their perceptions of how the proposed or established levels of ICT resources and the ICT diffusion process may impact perceived business outcomes [145]. A decision regarding the investment in an ICT initiative is subsequently reached, leading to the progression of the actual adoption phase of the initiative. The organization embraces and executes the initiative, yielding business outcomes from the adoption of that innovation.

The factors within the ICT implementation environment, notably “security” and “trust,” present significant challenges for organizations aiming to design, utilize, or adopt ICT innovations [146]. The intricacies of security encompass issues such as the failure of operating systems and the disruption of information access, which result in a multitude of challenges [124]. Moreover, consumers express apprehensions regarding the framework of Web security systems [147] In the realm of Internet banking, the paramount concern revolves around security, particularly in light of the potential for credit card misuse and the dissemination of personal information online. To establish trust between business partners and consumers, organizations must surmount the challenge of security by cultivating a reputation as a proficient technology-driven e-business service provider [119].

#### **2.8.4 Market structure**

The telecommunications markets across the global economy exhibit a significant degree of economic and technological dynamism. The latter phenomenon can be partially ascribed to the process of digitization, which has facilitated a convergence of markets that were once distinct, including cable television, fixed-line telecommunications, and broadcasting. Contemporary digital technologies have facilitated the expansion of markets wherein data, voice, video, and audio are conveyed through compressed digital signals [70].

The intersection of computing and telephony, coupled with the swift pace of technological evolution and the inherent uncertainties it brings, strengthens the tendencies toward vertical competition. The rise of global ICT markets diminishes entry barriers, potentially fostering the participation of government-backed local entities in the international ICT arena. Nevertheless, there exist significant counterbalancing drawbacks.

The intersection of computing and telecommunications has garnered significant interest across popular discourse, policy frameworks, and academic inquiry. Driven by increasingly affordable processing power and bandwidth, the prospects for inter-network competition within global telecommunications markets, alongside the rapid expansion of the Internet, convergence is broadly recognized as a novel, global market opportunity [149]. This burgeoning interactive "information superhighway" has facilitated the entry of numerous new firms and the mobility of established ones. Both aim to strategically align themselves to capitalize on what are anticipated to be some of the most significant business opportunities of the forthcoming decade. Within a global framework, two outcomes emerge from convergence. Initially, convergence

diminishes the barriers to entry in the telecommunications sector. A multitude of new applications will emerge, many of which have likely yet to be conceived. New enterprises will supply them with innovative business models [82].

In the interim, swift advancements in technology, coupled with inherent uncertainties and the rise of novel applications, will diminish the capacity of established entities to govern the trajectory of technological development and the benchmarks within the marketplace [70]. It is anticipated that governments beyond the United States, along with local enterprises, will engage in collaborative approaches for entering the global ICT arena or for safeguarding their positions within the local ICT landscape. This partnership between private and public entities will leverage the technological expertise of the firms involved, their relationships with local clientele, and their connections to international markets. Governmental initiatives aimed at directing demand may strengthen ties to local consumers or buyers [150].

In the realm of telecommunications, it is essential to make a clear distinction between the access markets and the long-distance or international telecommunications markets [148]. Access to households or firms, the users of telecommunication services, is essential for the provision of all services. When an incumbent firm possesses a substantial portion of the access market, it becomes imperative for the regulator to ensure that other network operators can secure interconnection at prices that are both non-discriminatory and aligned with cost considerations. Market power is an economic concept characterized by two fundamental components: (i) the relevant market and the specific product or service in question, which pertains to a firm's capacity to affect the pricing of that particular offering; and (ii) the sustainability of market power, where a dominant position that is vulnerable to competition from new

entrants presents a lesser concern for regulators compared to a firmly entrenched dominant position within the market.

The robust expansion of information and communication technology is predominantly propelled by advancements in telecommunications equipment and services. Data at the firm level indicate that the information technology industry, excluding telecommunications, is experiencing significant restructuring. While hardware remains the predominant segment, the role of data communications is becoming increasingly prominent. A considerable number of established IT hardware companies, such as IBM, are transitioning towards a focus on services. Nonetheless, companies from Asia hold significant positions in various hardware sectors. The swift consolidation occurring within the ICT industry, especially in telecommunications, is influencing the competitive dynamics of this sector. The ICT sector, by virtue of its capacity to generate innovation, cultivate entrepreneurial behavior, and expand the dimensions of pertinent markets, is unlikely to diminish the rivalry among competitors [44]. This, in turn, amplifies the competitive landscape through the emergence of novel markets and products (Hemphill, 2003). Countries within the OECD represent over 80% of global ICT production, a proportion that has exhibited remarkable stability.

Nonetheless, in non-OECD nations, the ICT market is expanding at a rate exceeding twice that of the OECD average, with the most significant markets, Brazil and China, experiencing rapid growth (OECD, 2000). The ICT market exemplifies a global marketplace that compels firms to engage in international competition for their continued existence. This phenomenon is characterized as a conflict between market dynamics and management strategies. The dynamics of globalization within the ICT

industry are influenced by a multitude of factors. The factors encompass the advancement and launch of enhanced products via organizational investments in research and development, the accessibility of venture capital for investments in information and communication technology, the emergence and swift expansion of novel product and service segments, as well as the overarching transition towards a service-oriented economy.

### **2.8.5 Organizational ICT Values**

Organizational ICT values refer to the core ethics or principles which the company will abide by, no matter what. Organizational values can be hostile to innovation. This includes organizational values that are too rigid.

Organizational ICT values play a crucial role in influencing ICT innovations within a company. These values shape the mindset, priorities, and decision-making processes related to information and communication technologies. Here are a few ways in which organizational ICT values can influence ICT innovations, along with relevant citations:

#### **1. Emphasis on Collaboration and Knowledge Sharing:**

Organizations that prioritize collaboration and knowledge sharing tend to foster an environment that encourages innovation in ICT. When employees are encouraged to share ideas, insights, and best practices, it leads to cross-pollination of knowledge and sparks innovation. As stated by West and Gallagher (2006), "Collaboration is a powerful driver of innovation.

## 2. Openness to Experimentation and Risk-Taking:

An organizational culture that promotes experimentation and risk-taking is more likely to drive ICT innovations. When employees feel empowered to take calculated risks and experiment with new technologies, it fosters a culture of innovation. According to [1], "Innovation requires a willingness to experiment and learn from failure."

## 3. Customer-Centric Approach:

Organizations that prioritize understanding customer needs and preferences are more likely to drive ICT innovations that align with those needs. By focusing on customer-centric innovation, companies can develop technologies and solutions that bring value to their target audience. As emphasized by von Hippel (2005), "Customer-centric innovation is a compelling approach to value creation."

## 4. Long-Term Vision and Strategic Planning:

Organizations with a long-term vision and strategic planning process tend to invest in ICT innovations that align with their future goals. By considering emerging technologies and industry trends, companies can proactively drive innovation in ICT. According to Burgelman, Maidique, and Wheelwright (2004), "Strategic planning is a process that supports an organization's ability to innovate."

## 5. Embracing Digital Transformation:

Organizations that value digital transformation are more likely to drive ICT innovations that enable process optimization, automation, and enhanced customer experiences. By embracing the digital revolution, companies can leverage emerging

technologies to gain a competitive edge. As highlighted by [2], "Digital transformation is about blending the digital and physical worlds to create value for customers."

These citations provide insights into the influence of organizational ICT values on ICT innovations. However, it's important to note that the influence can vary based on organizational context and other factors specific to each company.

### **2.8.6 Financial Investments**

Financial investment plays a central role in enabling organizations and economies to adopt and sustain disruptive ICT innovations. The availability of financial resources determines not only the acquisition of technology but also the capacity to maintain, upgrade, and scale it. Adequate investment ensures that the necessary infrastructure, such as broadband connectivity, cloud infrastructure, and cybersecurity systems, are established to support innovation diffusion.

In developing economies, financial limitations often constrain innovation initiatives, leading to incomplete implementation or early project abandonment. According to Schumpeter's innovation theory, investment capital acts as the driving force behind creative destruction, allowing new technologies to replace outdated ones. Therefore, funding mechanisms—whether through government grants, venture capital, or public-private partnerships—are critical for supporting emerging ICT solutions.

Empirical studies show that organizations with higher financial capacity demonstrate greater readiness to adopt and experiment with disruptive technologies. Financial

commitment signals managerial confidence, enhances stakeholder trust, and allows firms to take calculated risks in adopting innovations that may initially appear uncertain or unproven. Additionally, continuous financial support facilitates research and development (R&D), workforce training, and the creation of innovation-friendly environments.

In the context of developing economies such as Kenya, sustained investment in digital infrastructure and ICT entrepreneurship is vital for achieving scalability and long-term sustainability. Therefore, financial investment is not merely an enabler but a determinant of both the speed and extent of innovation adoption.

In most cases, the disruptive nature of disruptive innovation leads to creation of a new order within the organization with overhaul of existing working structures and establishment of new ones, and hence the financial implication of such changes must be put into consideration. This includes a clear analysis of the investment in personnel brought about by the new order as well as the new Information technologies necessary to develop and support the new innovations for them to be successfully implemented. In the same way, finances must be set aside to support the overall innovation process in order for the firm to ensure the success of the new disruptive ICTs.

Failure to put these three aspects into consideration will automatically lead to sub optimization which will overall affect the success of the disruptive ICTs.

In summary; financial investment plays a significant role in driving ICT (Information and Communication Technology) innovations. By providing the necessary resources and support, investments in ICT have a profound influence on the development and

adoption of new technologies. Here are a few key ways in which financial investment impacts ICT innovations, supported by relevant citations:

#### 1. Research and Development (R&D) Funding:

Financial investment enables increased R&D activities in the ICT sector, leading to the creation of novel technologies and solutions. According to a study by [154], R&D funding positively influences the level of ICT innovation, allowing companies to develop new products and services.

#### 2. Start-up and Venture Capital Investment:

Financial support from venture capital firms and angel investors plays a vital role in fostering ICT innovations, particularly within the start-up ecosystem. According to a report by [155] venture capital investment is a driving force behind technological advancements, as it provides early-stage companies with the necessary funds to develop and commercialize innovative ICT solutions.

#### 3. Public Sector Investment:

Government investment in ICT infrastructure and initiatives has a significant impact on innovation. For example, research by [156] highlights that public sector investment in broadband infrastructure positively influences the adoption of ICT innovations, such as cloud computing and e-government services.

#### 4. Corporate Investments and Partnerships:

Financial investments made by established corporations in ICT start-ups, through acquisitions or partnerships, contribute to the growth and advancement of innovative

technologies. A study by [87] emphasizes the role of corporate investment in fostering ICT innovation and enhancing competitiveness in the digital era. These citations demonstrate the influence of financial investment on ICT innovations, highlighting how funding drives R&D, supports start-ups, encourages public sector initiatives, and fuels corporate advancements in the ICT sector.

### **2.8.7 Organizational Processes**

Organizational processes refer to the internal systems, routines, and decision-making structures that influence how innovation is managed and implemented. They determine how resources are allocated, how employees interact with new technologies, and how leadership drives organizational change. Effective processes ensure that innovation efforts are strategically aligned with institutional goals and that feedback mechanisms exist for continuous improvement.

Disruptive ICT adoption requires organizations to possess adaptive processes capable of responding quickly to technological shifts. Rigid hierarchies, bureaucratic decision-making, and lack of cross-departmental collaboration can delay innovation uptake. Conversely, flexible, agile, and decentralized processes promote experimentation and facilitate the integration of new technologies.

From a management perspective, innovation-friendly processes are characterized by open communication, participatory decision-making, and the empowerment of employees to contribute ideas. Kotter's model of organizational change emphasizes the need for clear vision, urgency, and empowerment of change agents—attributes that are directly reflected in effective innovation processes.

Furthermore, organizational learning and knowledge management are integral to sustaining innovation. When processes allow for documentation, feedback, and knowledge sharing, organizations can replicate successful innovation practices and avoid repeating past mistakes. In the context of developing economies, this is especially critical, as resource limitations demand efficient and reusable organizational routines.

Therefore, strong organizational processes act as the operational backbone of innovation, translating financial investments and technological opportunities into actionable outcomes. They serve as the interface between strategy and execution, ensuring that innovations move beyond conceptualization to practical, value-adding implementation. Decision makers within an organization possess the authority to shape innovation through their direct oversight of the organizational structure. The allocation of control and responsibility within an organization is fundamentally shaped by its structural framework, which also dictates the categorization, coordination, and distribution of tasks among various departments and personnel. Academic insights into the realm of organizational structure suggest that it encompasses multiple sub-dimensions.

A study concerning the relationship between organizational structure and product customization by [99] examined the sub-dimensions of operations decentralization, emphasis on formal control, spans of control, and layers. A subsequent investigation by [159] examined how organizational structure influenced plant performance and time-based manufacturing. The study encompassed various dimensions, including the process of formalization, the number of hierarchical levels present, the locus of

decision-making authority, the extent of horizontal integration, and the levels of communication within the organization.

## 2.9 Conceptual Model

Innovation is considered a key driver of productivity growth. The introduction of new products and services as well as enhancements in methods of production and non-technological aspects of management and marketing enables firms to improve

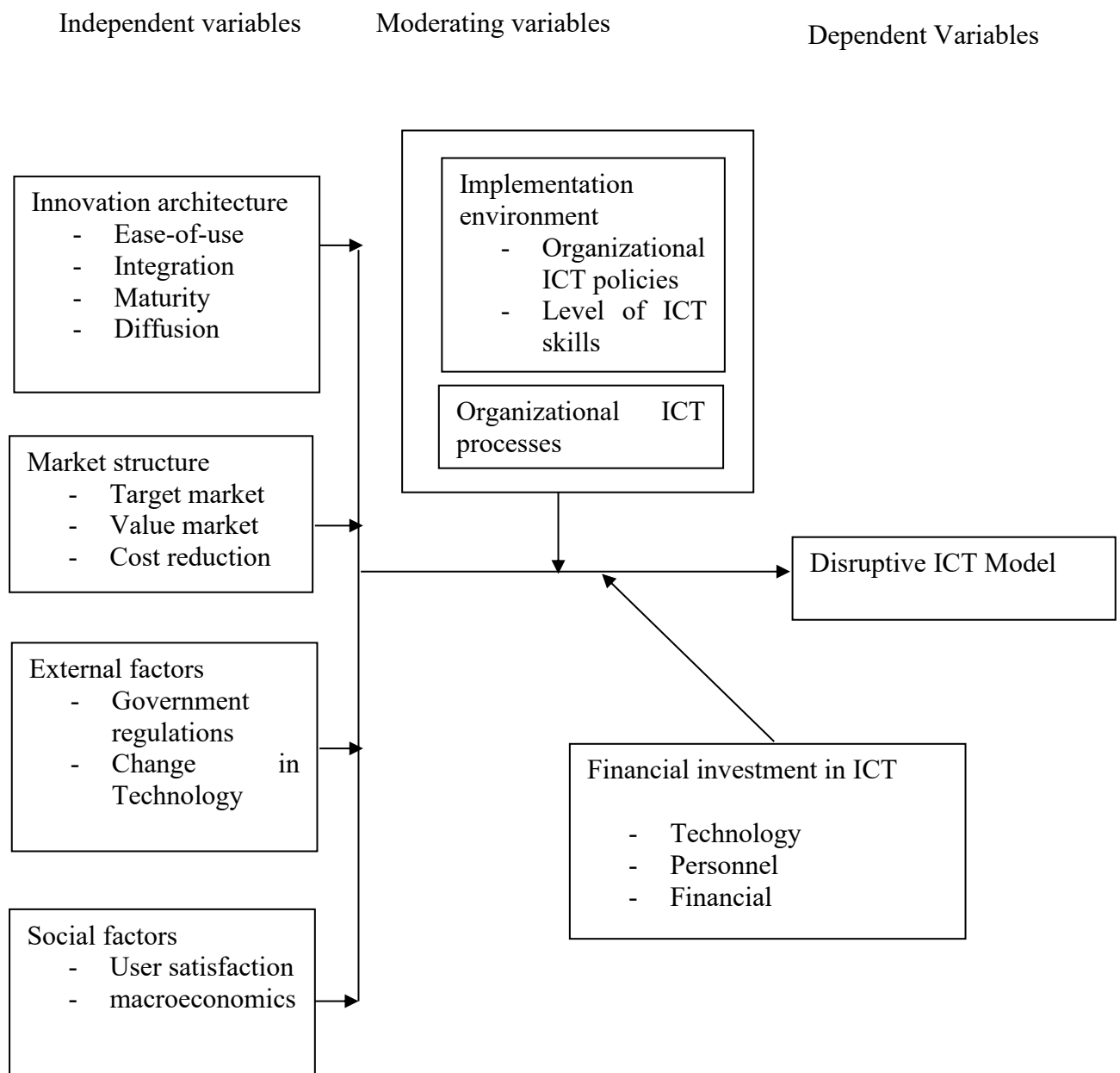


Figure 4: Conceptual model

## **2.10 Factors influencing the success of ICT innovations in Kenya**

ICT (Information and Communication Technology) disruptive innovations have had significant effects on various industries and society as a whole.

ICT disruptive innovations have transformed industries by introducing new business models, products, and services. For example, the rise of e-commerce platforms like Amazon has disrupted the retail industry, leading to the closure of traditional brick-and-mortar stores. Similarly, streaming services such as Netflix have disrupted the traditional television and film industry.

ICT disruptive innovations have greatly enhanced efficiency and productivity in many sectors. Automation, artificial intelligence, and machine learning have streamlined processes and eliminated repetitive tasks, allowing businesses to operate more efficiently. For example, manufacturing industries have benefited from robotics and automation technologies, leading to increased production rates and improved quality control.

ICT disruptive innovations have democratized access to information. The internet has made vast amounts of information readily available to people around the world, breaking down traditional barriers to knowledge. This has had a profound impact on education, research, and communication, empowering individuals and promoting global connectivity.

ICT disruptive innovations have eliminated intermediaries and facilitated peer-to-peer transactions. Platforms like Uber and Airbnb have disrupted the transportation and hospitality industries by directly connecting service providers with consumers,

bypassing traditional intermediaries. This has led to increased competition, reduced costs, and greater consumer choice.

ICT disruptive innovations have led to job displacement in certain sectors, particularly those involving routine and repetitive tasks. Automation and artificial intelligence have replaced some traditional jobs. However, disruptive innovations also create new job opportunities in emerging fields, such as data science, cybersecurity, and digital marketing. The workforce needs to adapt to changing skill requirements to remain employable.

ICT disruptive innovations have revolutionized communication and collaboration. Tools like email, video conferencing, instant messaging, and collaborative platforms have made it easier for people to connect and work together remotely. This has had a profound impact on businesses, enabling global teams and flexible work arrangements.

ICT disruptive innovations have challenged and disrupted traditional business models. Established companies that fail to adapt to technological advancements may find themselves at a disadvantage. Startups and agile companies that embrace disruptive technologies can gain a competitive edge, often leading to market disruptions and shifts in industry dynamics.

ICT disruptive innovations have raised concerns about privacy and security. With increased connectivity and data collection, individuals' personal information is at risk of unauthorized access and misuse. Cybersecurity has become a critical issue, requiring organizations and individuals to take measures to protect their data and privacy.

The success of ICT innovation depends on the interplay of technological capability, organizational readiness, financial investment, market demand, and policy environment. While financial investments provide the necessary resources for scaling innovations, organizational processes determine the efficiency and adaptability of deployment. Financial inputs relate to resource allocation, whereas organizational processes involve structures, routines, and culture that sustain innovation implementation.

### **2.11 Summary**

Recognizing the transformative potential of an innovation in its nascent phase can avert the potential downfall of established entities, even though no definitive principle of 'disrupt or be disrupted' is established. Previous studies have posited that tools designed to support decision-making are essential for evaluating emerging technologies, suggesting that the disruptions caused by these innovations are not necessarily unavoidable. In light of the criticism directed at the disruptive innovation theory for its dependence on selective ex-post analysis, there is a strong recommendation for the implementation of such evaluative tools.

An organization or its constituent unit may pursue both radical and incremental innovation in various aspects of its processes and products. Take, for instance, the methodology involved in the creation of printed documents. From the viewpoint of a typist and their work unit, an electric typewriter represents a modest advancement over a manual typewriter, as it does not fundamentally change the activities and resources required to perform the task at hand. Conversely, a word processing computer represents a significant advancement over the manual typewriter, as it

demands distinct activities to accomplish tasks, thereby requiring varied competencies, resources, standards, and procedures.

In relation to the subject of product, one might contemplate computer software. New iterations of a specific software product represent incremental advancements, as they improve or broaden existing functionalities and attributes. Nonetheless, the implementation of an entirely distinct software design signifies a profound advancement over the current iteration. For instance, IBM's relational database offering, DB2, marked a significant advancement compared to its predecessor, the hierarchical system IMS. Various forms of knowledge, competencies, standards, and procedures are requisite for engaging with it effectively.

An exemplary instance of transformative innovations, illustrating how previously overlooked pathways have emerged to influence the landscape of information and communication technology, can be drawn from the Kenyan ICT sector. The progression of MPesa mobile banking exemplifies scenarios in which established theories may fall short in forecasting the path of innovations within such contexts. Although economic factors have traditionally underpinned significant theories regarding the development and characterization of innovation pathways, the Kenyan ICT sector has, in numerous respects, offered a distinct viewpoint on the pivotal role that social factors can play in driving innovation and facilitating the diffusion of information and communication technologies.

A thorough examination of this offers a fresh perspective that ought to steer scholars in formulating comprehensive theories capable of tackling inquiries and challenges associated with ICT innovations, not only within Western contexts but also in emerging economies. The findings indicate that the implementation environment

significantly influences the success of innovations as outlined by disruptive innovation theory. Furthermore, the extensive application of these theories can dilute their effectiveness, underscoring the necessity to incorporate prior experiences in order to refine the fundamental concepts of the theory. This integration aims to enhance the likelihood of success in this research endeavor.

Moreover, a study conducted by [87] indicates that the traits that characterize disruptive innovations are multifaceted; thus, evaluating the disruptive potential of innovations ought to rely on comprehensive measures. Further [160] indicates that the prevailing evaluations predominantly emphasize the technological dimension; only a handful have incorporated the market facet, while the external environment is afforded even less consideration. The external environment significantly influences the realization of disruptive innovation and must be considered; thus, it is essential to incorporate all these factors when developing models for disruptive ICT innovations.

It is evident that disruptive innovations in ICT have instigated profound transformations across various industries, societal structures, and everyday experiences. Although they present a multitude of advantages, they simultaneously introduce challenges that must be confronted to guarantee the responsible and ethical application of technology.

## **2.12 Gaps in literature review**

The theories created to elucidate innovation processes in nations like the United States may serve as a preliminary reference when examining Kenya, but they remain merely a starting point. In a continent characterized by extensive historical international

engagement—whether through governmental actions, development initiatives, or multinational enterprises—it is essential to consider the influence of foreign entities possessing economic resources, alongside innovations aimed at achieving social impact, to comprehend the present landscape of technological innovation in Kenya.

[161] posited that the economic history of the African continent is a "co-production of Africa and Europe through centuries of economic and political interaction." The dynamics of the connection among African, European, and American entities engaged on the continent have undoubtedly evolved throughout time. Neglecting the historical social and economic power dynamics inherent in the international setting of Kenya's ICT innovation ecosystem would be detrimental. Researchers widely concur that the primary catalyst for innovation in developing nations is predominantly social factors, whereas in Western economies, economic drivers prevail, albeit with some minimal social influences. This raises the question of whether ideas formulated in the West can be entirely applicable to the environment of a developing economy. This, as per [118], has demonstrated that it cannot be adequately substantiated by relying on her arguments regarding Kenyan ICT breakthroughs.

The reviewed literature underscores the importance of contextualizing disruptive innovation within developing economies, where resource limitations and institutional dynamics shape adoption patterns. The theoretical insights presented form the foundation for the conceptual framework tested in subsequent chapters, particularly in linking Christensen's disruptive innovation theory to the empirical findings presented.

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.0.1 Overview**

This section outlines the materials, tactics, and methodologies employed by the researcher to collect research data, as well as the analytical techniques utilized and the rationale for each approach. Furthermore, it delineates the research design, examining the philosophical and methodological foundations of the study. It also emphasizes the inquiry approaches and strategies, the perspectives of the scientific community and the researcher, as well as the methods that enabled and facilitated the research design in addressing the research questions, structured according to the six layers of the research onion as applied in this study [1]. The chapter additionally examines the study population, the determination of sample size, as well as the equipment for data collection, the procedures for data collection, and the strategies for data analysis.

### **3.1 Research Design**

The study adopted a mixed-methods design, combining quantitative and qualitative techniques to provide a comprehensive understanding of the factors influencing disruptive ICT adoption. The quantitative approach provided measurable relationships among variables, while qualitative insights enriched interpretation through stakeholder perspectives. This differs from a multi-method approach, which treats methods independently rather than in an integrated framework.

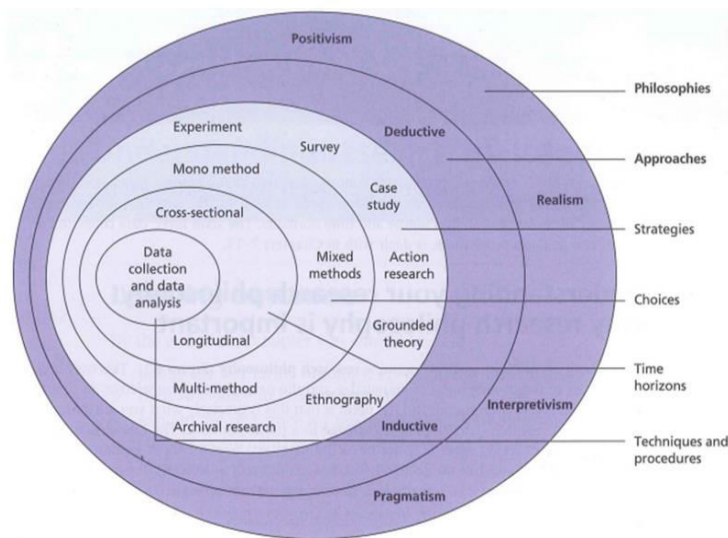
[2] asserts that a study's research design gives guidance for gathering and evaluating data. Research design is seen as essential due to its function as a vital link between the theoretical frameworks and arguments that inform the research and the empirical evidence gathered. According to [3], a research study design may be classified as exploratory, descriptive, or explanatory. They may intersect based on the study objective or the phase of the research process. For this research study, the initial phase was to logically employ an exploratory research design. This was because the

study delved into a complex, context-specific phenomenon where established models from developed economies may not directly apply. At this stage, the researcher sought to understand the unique landscape of ICT in Kenya, identifying key challenges, stakeholders, and emergent local innovations through methods like interviews with bank managers, and by analyzing existing case studies. The goal here was not to test a predefined model but to gather rich, qualitative insights that informed and shaped the very construction of the proposed disruptive innovation model and reference architecture, ensuring it is grounded in the realities of the Kenyan context.

Once a preliminary model was conceptualized, the research transitioned into a descriptive research design to systematically document its components and how they interrelate within the case study of Kenya. This phase involved clearly detailing the reference architecture—its layers, standards, and proposed functionalities—and mapping the innovation model's processes. Following this, to move beyond mere description and validate the model's efficacy, an explanatory research design was necessary. This final phase sought to establish causal relationships, by comparing sectors in Kenya that have adopted the model against those that have not, to explain why and how the model leads to specific disruptive outcomes, such as increased digital inclusion or economic growth, thereby testing the core. Thus, the study was exploratory sequential in approach. The aim of this study was to identify characteristics influencing ICT adoption, utilize a theoretical framework to comprehend the adoption process, and subsequently formulate a model for disruptive ICT advances in emerging economies. [2], while elucidating the mixed technique employed in this study, provides the subsequent framework: Exploratory design; philosophical assumptions; commence with positivism for the quantitative phase, transition to constructivism for the qualitative phase. This research included

exploratory, descriptive, and explanatory designs, incorporating all elements of a mixed-methods study along with the philosophical tenets of positivism, constructivism, and pragmatism.

[3] depict the research process as an onion with multiple layers and methods that need to be used correctly when doing research. The authors assert that when utilizing the research onion, each layer must be meticulously considered prior to addressing data gathering and analysis, which are fundamental to the research process. Figure 3.1 delineates the components of the onion layers, which will be examined in the subsequent subsections, progressing from the outer layer to the core: philosophies, approaches, strategies, choices, time horizons, and methodologies and processes as they pertain to the study.



**Figure 3.1 Research Onion:** [163]

**Table 3.1: Methods and Design Procedures Applied to each Objective**

	<b>Objectives</b>	<b>Method</b>	<b>Data Collection Tool</b>	<b>Analytical tool</b>
1.	To assess the status of disruptive ICT innovations in Kenya.	Mixed method	Qualitative and quantitative (questionnaire, interview protocol and	Thematic, Descriptive and Inferential techniques using R

			literature review)	
2.	To determine through the lens of a theoretical model the factors that influence disruptive ICT innovations success.	Mixed method	Literature review and interview protocol	Thematic
3.	To develop a model for adoption of disruptive ICT innovations.	Multi method	Literature review to verify availability of other models	Thematic, Inferential techniques using R
4.	To propose an architecture for adoption of disruptive ICT innovations in developing economies.	Multi method	Literature review to verify availability of other models	Thematic, Inferential techniques using R

### 3.2 Research Philosophy

The first layer of the study onion is deemed the most critical. The research philosophy is regarded as a conviction or concept concerning the gathering, interpretation, and analysis of obtained data. Research philosophy pertains to the advancement of knowledge within a particular domain. Consequently, the study employed this layer to represent significant assumptions, opinions, and perspectives as perceived by the researcher; consistent with [163] assertion that aims to encompass lived experience. This layer consequently affected the researcher's approach to the research plan and methodology employed for the investigation.

### 3.3 Research Approach

According to [1], the second layer of the research onion is the research approach. The author categorized the research methodology into deductive and inductive approaches. The deductive technique focuses on utilizing literature to identify hypotheses and concepts that the researcher employs to evaluate evidence. The inductive technique, conversely, entails gathering data and evaluating the hypothesis

formulated during the deductive step in light of the data analysis outcomes [3]. The researcher employed this layer to deductively construct a hypothesis, which served as a framework, and subsequently conducted inductive testing of the theory.

### **3.4 Research Strategy and Time Horizons**

Third and fourth layers of the study onion are research strategy and time horizons [4]. This research employed a survey strategy and case study, as these methods are typically aligned with the deductive approach, according to the perspective of [2]. This approach is widely recognized and frequently employed in research to address questions pertaining to who, what, where, how much, and how many [2]. In light of these considerations, the researcher embraced [1]. categorizes the approaches into mono method, mixed method, and multi methods. Various elements, including research inquiries, aims, and subject matter, consistently assist in determining the most suitable research methodology. The research employed a mixed methods design, which, as noted by [2], serves as a systematic approach for the collection, analysis, and integration of both quantitative and qualitative methodologies within a single study to gain insight into a research issue.

[4] characterizes quantitative research design as a framework wherein the researcher delineates the subject of study, formulates precise and focused inquiries, gathers measurable data from participants, employs statistical methods for analysis, and undertakes the investigation with impartiality and objectivity. Consequently, it is expected to embody an objective and deductive character. [1] further asserts that it generally delineates elements such as sample size, categories of data to be gathered, methodologies for sampling and recruitment, procedures for data collection, as well as strategies for data management and analysis. This method is posited to have no

impact on the research outcomes, as participant responses are systematically coded, categorized, and distilled into numerical data suitable for statistical analysis. [1] notes that quantitative research does not eliminate or control all variables and may overlook significant human experiences; this consideration prompted the researcher to incorporate a qualitative approach to encompass human experience.

Qualitative research frequently serves a confirming purpose. [1] claims that textual data, including surveys, interviews, focus groups, key informants, conversational analysis, and observation, are gathered and tested through qualitative research. A qualitative research method is characterized by the researcher depending on participants' perspectives, posing broad and general inquiries, gathering predominantly textual data from participants, identifying and analyzing themes within this text, and conducting the investigation in a subjective and potentially biased fashion. It is typically employed to examine a matter concerning the interviewees' work by gathering their opinions, attitudes, and perceptions. [2]. [4] indicate that the value of qualitative research lies in the significance that life experiences possess for respondents. Qualitative research design is inherently constructivist, characterized by multiple realities, subjectivity, and an inductive approach.

Advocate for the implementation of mixed-method research to mitigate the constraints of exclusively qualitative or quantitative studies and to amalgamate the advantages of qualitative theory development with quantitative theory validation. Other scholars [2] have claimed that the objective of a mixed-method design is to achieve a more comprehensive understanding of the examined model and to mitigate the limitations of the quantitative approach. [4] further asserts that the integration of both qualitative and quantitative methodologies is feasible and very suitable inside a singular investigation.

[4] addresses the appropriate circumstances for employing mixed methods by asserting that such an approach is warranted when the integration of both quantitative and qualitative data yields a more comprehensive understanding of the research problem than either data type alone; when a singular research method (qualitative or quantitative) is insufficient to tackle the research problem or answer the research questions; and when the researcher adopts a pragmatic philosophical stance, which was applicable to this study in terms of practicality, diverse perspectives, and the balance of bias and objectivity. Furthermore, [1] addresses the timing by asserting the necessity to integrate a qualitative element into a predominantly quantitative study; to progress from one phase of research to the next; to initially explore qualitatively before constructing an instrument; and to subsequently conduct qualitative follow-up on a quantitative study to acquire more nuanced information. [4] advocates for the utilization of mixed methods, asserting that it enhances researchers' confidence in their findings, fosters the development of innovative methodologies, provides novel approaches to addressing issues alongside traditional data collection techniques, and aids in uncovering unforeseen aspects of a phenomenon. The preceding debate enabled the researcher to integrate the mixed research method into the study, facilitating the testing of findings, elucidating the outcomes of the initial phase in greater depth, and offering a more comprehensive knowledge than either quantitative or qualitative methods alone (triangulation).

The researcher employed an explanatory sequential design within the mixed method framework, wherein quantitative data was initially collected, followed by qualitative data, as noted in [4]. To substantiate the rationale for adopting this approach, the researcher referenced [1] regarding the appropriate circumstances for employing explanatory sequential design, which the author identifies as follows: the researcher

and research problem exhibit a quantitative orientation; significant variables and instruments are accessible; participants are available for subsequent data collection; sufficient time exists to execute two phases; resources are constrained, necessitating the collection and analysis of one data type at a time; and new inquiries arise from quantitative findings.

### **3.6 Choice of study area**

The choice of Kenya as the study area for researching the adoption of disruptive ICT innovations in developing economies is justified by several factors:

Kenya has experienced significant growth and investment in its telecommunication sector over the past few decades. The country has a well-established telecommunications infrastructure and is considered a leader in ICT adoption within the African continent.

Kenya represents a typical example of a developing economy experiencing rapid technological advancement and digital transformation. Studying the adoption of disruptive ICT innovations in Kenya provides valuable insights into the challenges and opportunities faced by emerging markets in embracing new technologies.

Kenya has been at the forefront of mobile technology adoption, particularly with the success of mobile money services like M-Pesa. This high level of mobile penetration demonstrates the readiness of Kenyan consumers and businesses to embrace innovative ICT solutions, making it an ideal setting for studying disruptive ICT adoption.

The Kenyan government has implemented various policies and initiatives to promote ICT development and innovation. These include initiatives to improve internet connectivity, promote digital literacy, and foster a conducive environment for ICT entrepreneurship. Understanding how these policies influence the adoption of disruptive ICT innovations is crucial for both academia and policymakers.

Kenya's telecommunication sector is characterized by the presence of multiple firms competing in a dynamic market. Studying the adoption of disruptive ICT innovations across the three leading telecommunication firms allows for a comprehensive analysis

of different organizational strategies, capabilities, and responses to technological disruption.

Findings from research conducted in Kenya can provide valuable insights applicable to other developing economies facing similar challenges and opportunities in ICT adoption. Therefore, studying disruptive ICT adoption in Kenya contributes not only to understanding the local context but also to informing broader theoretical frameworks and practical interventions for promoting technology adoption in developing regions.

Overall, the choice of Kenya as the study area offers a rich and relevant context that justified investigating the adoption of disruptive ICT innovations, contributing to both academic knowledge and practical implications for policymakers, industry practitioners, and other stakeholders.

### **3.7 Target population**

The target population for this research proposal comprises senior management personnel within the three leading telecommunication firms operating in Kenya. The study aims to gather insights and perspectives from individuals who hold influential roles and decision-making authority within their respective organizations. Specifically, the target population includes Chief Executive Officers (CEOs), Chief Operating Officers (COOs), Chief Technology Officers (CTOs), Chief Information Officers (CIOs), Chief Marketing Officers (CMOs), Chief Financial Officers (CFOs), Directors of Operations, Directors of Technology, Directors of Marketing, Directors of Finance, Managers of Strategic Planning, Managers of Product Development, and Managers of Business Development.

These individuals were chosen due to their significant roles in shaping organizational strategies, implementing technological innovations, and overseeing business operations within the telecommunication sector in Kenya. By targeting this specific group, the research aims to capture diverse perspectives and insights into the adoption of disruptive ICT innovations within the context of developing economies.

The total population of interest consisted of 118 senior management personnel across the three leading telecommunication firms in Kenya with investments in mobile

banking. However, the research intended to collect data from a sample size of 81 individuals, representing approximately half of the total population. This sample size is considered sufficient to achieve the research objectives while ensuring feasibility in data collection and analysis.

### **3.7.1 Sample size inclusion and exclusion criteria**

The sample size of 81 senior management personnel from the three leading telecommunication firms in Kenya is determined based on several considerations:

The sample size is calculated to ensure sufficient statistical power to detect meaningful relationships and differences in the data. By achieving an adequate sample size, the research can increase the reliability and validity of its findings, allowing for more robust conclusions to be drawn.

Given the constraints of time, resources, and access to participants, the chosen sample size of 81 is considered feasible for data collection and analysis within the scope of the research project. It strikes a balance between the need for a representative sample and practical limitations.

The sample size aims to capture a diverse range of perspectives and experiences among senior management personnel within the telecommunication sector in Kenya. By including individuals from multiple firms and various senior positions, the research seeks to achieve a comprehensive understanding of the factors influencing the adoption of disruptive ICT innovations.

The sample was obtained using a combination of stratified and snowball sampling techniques. Snowball sampling is a non-probability sampling technique where existing study participants recruit future participants from among their acquaintances, creating a snowball-like growth in the sample size. A combination of stratified and snowball sampling ensured diversity and that key individuals with authority and expertise participated. Researchers first identified and contacted key senior management personnel at the three leading telecommunication firms. These initial participants then helped to identify and refer other eligible senior managers to participate in the study, allowing the sample to grow through the snowball effect. The sample size was determined using the Krejcie and Morgan (1970) formula, which

provides a statistically valid sample based on the target population. This ensured sufficient representation of the ICT stakeholder groups.

#### Krejcie and Morgan Formula

$$s = \frac{X^2 \cdot N \cdot P \cdot (1-P)}{(d^2 \cdot (N-1)) + (X^2 \cdot P \cdot (1-P))}$$

#### Given Parameters

- Population Size (N): 118
- Estimated Proportion (P): 0.5 (for maximum sample size)
- Margin of Error (d): 0.05
- Chi-Square Value (X<sup>2</sup>): 3.841 (for 95% confidence level)

#### Calculation Steps

1. Substituting Values into the Formula:

$$s = \frac{3.841 \cdot 118 \cdot 0.5 \cdot (1-0.5)}{(0.05^2 \cdot (118-1)) + (3.841 \cdot 0.5 \cdot (1-0.5))}$$

2. Calculating the Components:

- $1-P = 0.5$
- $0.05^2 = 0.0025$
- $N-1 = 117$

3. Calculating the Numerator:

$$\text{Numerator} = 3.841 \cdot 118 \cdot 0.5 \cdot 0.5 = 3.841 \cdot 118 \cdot 0.25 = 3.841 \cdot 118 \cdot 0.25 = 3.841 \cdot 29.5 \approx 113.82695$$

4. Calculating the Denominator:

$$\text{Denominator} = (0.0025 \cdot 117) + (3.841 \cdot 0.5 \cdot 0.5) = 0.2925 + 0.96025 = 1.25275$$

5. Final Calculation:

$$s=113.826951.25275\approx 90.83 \quad s=1.25275113.82695\approx 90.83$$

The required sample size  $ss$  for a population size of  $N=118$  is approximately 90.83. Since the sample size must be a whole number, this was rounded to 91. Of the 91 questionnaires, 81 were successfully filled and returned.

With 81 participants, the research can conduct meaningful comparisons and analyses across different organizational roles, firm sizes, and strategic priorities. This allows for a nuanced exploration of how various factors, such as organizational structure and leadership dynamics, influence ICT adoption decisions.

### **3.7.2 Justification of Inclusion and Exclusion Criteria:**

#### **3.7.2.1 Inclusion Criteria**

Participants were to be holding senior management positions within the three leading telecommunication firms in Kenya, such as CEOs, COOs, CTOs, CIOs, CMOs, CFOs, Directors, and Senior Managers. This criterion ensured that the respondents have the necessary authority and expertise to provide insights into strategic decision-making processes within their organizations.

Participants were also actively employed by the selected telecommunication firms during the time of data collection to ensure relevance and currency of their perspectives.

#### **3.5.2.2 Exclusion Criteria**

**Non-Senior Management Personnel:** Individuals who do not hold senior management positions within the telecommunication firms, such as mid-level managers, junior staff, or external consultants, are excluded from participation. This criterion ensures that the sample consists of individuals with sufficient decision-making authority and strategic influence.

**Inactive Employment:** Former employees or individuals on extended leave from their organizations are excluded from participation, as their perspectives may not reflect current organizational dynamics or decision-making processes.

By applying these inclusion and exclusion criteria, the research aims to target a specific group of senior management personnel who can provide valuable insights into the adoption of disruptive ICT innovations within the telecommunication sector in Kenya. This approach enhances the relevance, reliability, and validity of the study's findings.

### 3.8 Sample size

Sampling constitutes a methodical approach to selecting a subset from a broader population for the purpose of research; it involves the careful selection of individuals in a manner that ensures their representation of the larger group from which they are drawn [164]. Establishing the appropriate sample size is essential for ensuring the validity of the research findings.

Research attains its utmost value when it is both dependable and reflective of your business context. A representative sample population was required from the total population. A sample size constituting 30% of the population was deemed sufficient for the purpose of data collection. The researcher intentionally selected 30% of the participants due to their recognized expertise and insight regarding the adoption of technology. As noted in [165], a sample size of 30 is generally regarded as standard, and frequently, this normative sample enhances the confidence level regarding the population.

Table 3.2: Sample size

<b>Category</b>	<b>Number</b>	<b>Sample size &gt; 30%</b>
Senior corporate Employees	48	24
ICT officers	44	22

Departmental heads	46	23
Section heads	24	12
<b>Sample size</b>		<b>81</b>

---

### **3.9 Data collection Instruments**

The research collected both qualitative and quantitative data using questionnaires and interviews. The use of both qualitative and quantitative data in this research proposal is justified for several reasons

Qualitative data, such as interviews or focus groups, can provide in-depth insights into the perceptions, attitudes, and behaviors of senior management personnel regarding the adoption of disruptive ICT innovations. It allows researchers to explore nuances, motivations, and contextual factors that may influence decision-making processes within organizations.

Quantitative data, typically gathered through surveys or structured questionnaires, enable researchers to collect standardized information from a larger sample size. This approach facilitates statistical analysis, allowing for generalization of findings to a broader population of senior management personnel within the telecommunication sector in Kenya. Quantitative data can also help identify patterns, trends, and correlations that may not be apparent from qualitative data alone.

Qualitative and quantitative data complement each other, providing a more comprehensive understanding of the research topic. Qualitative data can help generate hypotheses and insights that can then be tested and validated using quantitative

methods. Conversely, quantitative data can help contextualize qualitative findings by providing statistical evidence and numerical support.

By using both qualitative and quantitative data, researchers can employ triangulation, which involves cross-validating findings from different sources or methods. Triangulation enhances the reliability and validity of the research findings by reducing the likelihood of bias and increasing the robustness of the conclusions drawn.

The research objectives outlined in the proposal, such as gathering insights into organizational strategies, understanding challenges and opportunities, and assessing the impact of government policies, can benefit from a combination of qualitative and quantitative approaches. Qualitative methods can delve into the complexities of these issues, while quantitative methods can provide broader trends and statistical significance. Combining qualitative and quantitative data allows researchers to capitalize on the strengths of each method while mitigating their respective limitations. It also enhances the richness and depth of the research findings, making the study more informative and impactful.

### **3.9.1 Questionnaires**

Questionnaires mostly utilize a paper-and-pencil approach for data collecting.

Utilizing paper and pen complicates the responders' ability to gather further data or information that may later prove essential. Consequently, it is imperative to anticipate the necessary data or information and ensure that pertinent questions are included in the questionnaire. Consequently, meticulous care must be directed into formulating clear, unequivocal, and pertinent inquiries; thus, the phrasing of the questions is crucial.

Questionnaires were appropriate for this purpose as they enabled the collection of data from a substantial sample across various geographies. Questionnaires gather directly visible facts and solicit details regarding achievements. A systematic questionnaire was employed in this research investigation. It comprised twenty closed-ended questions. A closed-ended question presents a query along with predetermined response options for the respondents to select from. Each responder was required to answer questions based on an equal interval scale as follows

5 –Strongly Agree

4 - Agree

3 - Neutral

2 - Disagree

1 - Strongly Disagree

The questions aimed to investigate aspects deemed essential for assessing the degree of green IS implementation inside these organizations and to evaluate their perspectives on the government's role in green IS adoption. The questions were designed to examine the fundamental aspects of the reasoning for the contextual framework, which delineates the proposed framework for assessing the success of an ICT breakthrough in green IS adoption.

### **3.9.2 Interviews**

Interviews are conducted using a standard set of predetermined queries that can be modified to accommodate the specific circumstances [166]. This study included interview schedules to augment questionnaires. The interview schedules outlined in Appendix VI were informed by the research objectives. The interviews were thereafter conducted solely with the senior management of the target firms.

A comprehensive interview with the senior personnel of the target firms was conducted to gather information essential for analyzing and comprehending the trajectory of ICT developments, aimed at formulating an effective model..

### **3.10 Validity & Reliability**

A pilot study was conducted in Eldoret to pre-test the research instrument. Reliability was measured using **Cronbach's Alpha**, yielding values above 0.7 for all constructs, confirming internal consistency. Content validity was ensured through expert review and pilot adjustments to ambiguous items.

#### **3.10.1 Validity**

Measuring the validity of a questionnaire involves assessing whether the questionnaire accurately measures what it intends to measure [167]. There are several types of validity that researchers consider which were properly used in this study:

##### **Content Validity**

This refers to the extent to which the content of the questionnaire represents the entire domain of interest. Content validity can be assessed by expert judgment, where subject matter experts review the questionnaire to ensure that it covers all relevant aspects of the topic.

##### **Construct Validity**

This refers to the extent to which the questionnaire measures the theoretical construct or concept it is intended to measure. Construct validity can be assessed through

techniques such as factor analysis, convergent validity (comparing the questionnaire with other measures of the same construct), and discriminant validity (demonstrating that the questionnaire does not correlate highly with measures of unrelated constructs).

#### Criterion Validity

This involves comparing the scores obtained from the questionnaire with scores obtained from a criterion measure that is already established as valid. Criterion validity can be assessed using concurrent validity (administering both the questionnaire and the criterion measure at the same time and comparing their scores) or predictive validity (administering the questionnaire first and then comparing its scores with future outcomes measured by the criterion).

Face Validity: This refers to the extent to which the questionnaire appears, on the face of it, to measure what it is intended to measure. Face validity is often assessed subjectively by examining whether the items in the questionnaire seem relevant and appropriate to the respondents.

#### Concurrent Validity

This involves comparing the results of the questionnaire with another established measure that assesses the same construct. The correlation between the two measures indicates concurrent validity.

#### Predictive Validity

This assesses whether the scores obtained from the questionnaire can predict future behaviors or outcomes related to the construct being measured.

### **3.10.2 Reliability**

Reliability denotes the consistency of an instrument; specifically, does it consistently measure its intended variable? Reliability is intrinsically linked to the validity of the measurement [168].

Following the pilot study, it was deemed essential to assess the reliability of our questionnaire in relation to the research questions for each variable. Reliability encompasses various facets; nonetheless, in our context, it was crucial to assess the internal consistency of each question set pertaining to a certain variable. Internal consistency denotes the extent to which the items comprising the scale are cohesively related. Are they all assessing the same fundamental construct?

The predominant metric for assessing internal consistency is the Cronbach's alpha coefficient. The Cronbach's alpha coefficient varies from 0 to 1. [169] contend that the Cronbach's alpha coefficient of a scale must exceed . George & Marley (2003) present a guideline for assessing reliability and consistency using the Cronbach alpha coefficient. 0.9 – Excellent; > 0.8 – Good; > 0.7 – Acceptable; > 0.6 – Fair; > 0.5 – Acceptable; < 0.5 – Unacceptable. They emphasize that Cronbach's alpha values are highly sensitive to the scale; therefore, in instances when less than five items are assessed, it may be crucial to utilize the inter-item correlation, which should range between 0.2 and 0.4.

The research questions for each variable were tested as indicated in Tables 3.3, 3.4, 3.5, and 3.6 below, demonstrating reliability and consistency.

### **ICT innovation structure**

The Cronbach's alpha statistic for the ICT innovation structure was conducted about the variable metrics related to the success of disruptive ICT innovations. A total of five questions were designed to assess this characteristic. The Cronbach alpha statistic yielded a result of 0.811, indicating a high degree of consistency among the questions

used to measure this variable, thus categorizing it as good. This is illustrated in Table 3.8.

**Table 3.3: Reliability Statistics for support infrastructure**

Cronbach's Alpha	N of Items
0.811	5

## **2. ICT Implementation Environment**

The Cronbach alpha statistics for ICT implementation environment set for the variable metrics in relation to the success of disruptive ICT innovations. was carried out. Overall, 5 questions were set to measure this variable. The Cronbach alpha statistic result was 0.793, this falls within the good scale hence meaning that the questions used in measuring this variable had a high degree of consistency. This is shown in the Table 3.8.

**Table 3.4: Reliability Statistics for ICT implementation environment**

Cronbach's Alpha	N of Items
0.793	5

## **3. Market Structure**

The Cronbach alpha statistics for ICT market structure set for the variable metrics in relation to the success of disruptive ICT innovations. was carried out. Overall, 5 questions were set to measure this variable. The Cronbach alpha statistic result was

0.860, this falls within the good scale hence meaning that the questions used in measuring this variable had a high degree of consistency. This is shown in Table 3.8.

**Table 3.5: Reliability Statistics for Market structure**

Cronbach's Alpha	N of Items
0.860	5

#### **4. Government Regulations**

The Cronbach alpha statistics for ICT government regulations set for the variable metrics in relation to the success of disruptive ICT innovations. was carried out. Overall, 5 questions were set to measure this variable. The Cronbach alpha statistic result was 0.723, this falls within the good scale hence meaning that the questions used in measuring this variable had a high degree of consistency. This is shown in Table 3.8.

**Table 3.6: Reliability Statistics for Government regulations**

Cronbach's Alpha	N of Items
0.723	4

#### **5. Organizational ICT values**

The Cronbach alpha statistics for organizational ICT values set for the variable metrics in relation to the success of disruptive ICT innovations. was carried out. Overall, 5 questions were set to measure this variable. The Cronbach alpha statistic

result was 0.791, this falls within the good scale hence meaning that the questions used in measuring this variable had a high degree of consistency. This is shown in Table 3.8.

**Table 3.7: Reliability Statistics for Organizational ICT values**

Cronbach's Alpha	N of Items
0.791	5

## **6. Financial Investments in ICT Innovations**

The Cronbach alpha statistics for financial investment in ICT innovation set for the variable metrics in relation to the success of disruptive ICT innovations. was carried out. Overall, 5 questions were set to measure this variable. The Cronbach alpha statistic result was 0.860. Based on [168] proposed rule for determining the level of reliability in Cronbach alpha statistics, this falls within the good scale hence meaning that the questions used in measuring this variable had a high degree of consistency. This is shown in Table 3.8.

**Table 3.8: Reliability Statistics for financial investments in the ICT innovation**

Cronbach's Alpha	N of Items
0.82	5

## **7. Organizational Processes**

The Cronbach alpha statistics for ICT organizational processes set for the variable metrics in relation to the success of disruptive ICT innovations. was carried out. Overall, 5 questions were set to measure this variable. The Cronbach alpha statistic

result was 0.831, this falls within the good scale hence meaning that the questions used in measuring this variable had a high degree of consistency. This is shown in Table 3.9.

**Table 3.9: Reliability Statistics for Organizational Processes**

Cronbach's Alpha	N of Items
0.831	5

### **3.11 Data collection procedures**

Before proceeding to data collection, it was considered important to pre-test the data collection instruments to ensure that they are fit for the research. In the case of this research, the researcher carried out a pilot study in a tea factory within Kericho County taking necessary precautions to ensure that the questionnaire was clear and understandable.

Once the pilot study was completed, the results were analyzed for reliability and consistency using the Cronbach Alpha statistics from which necessary modifications were done to the questionnaire where necessary before proceeding to administer the questionnaire. The researcher then commenced the data collection procedure by dispatching the questionnaire to the respondents in person upon receiving the approval from the target companies.

### **3.12 Data analysis and presentation**

#### **3.12.1 Analysis of quantitative data**

The collected data was subsequently prepared for analysis and examined using both R and SPSS software. Regression analysis was conducted on the data to determine the links between the independent factors and the dependent variable. Data summaries were displayed using percentages, bar graphs, regression tables, figures, and pie charts to elucidate the findings of the three research issues. Ultimately, conclusions were reached, and the results were utilized to refine the essential components of the model in preparation for validation.

### **3.12.2 Analysis of qualitative data**

Qualitative data was first analyzed to identify patterns. repetitive responses were then coded and included as part of responses in the qualitative data for analysis

### **3.13 Ethical Considerations**

This research adhered strictly to ethical principles that govern several regulations to assure the quality and integrity of the study. The researcher obtained authorization for data collection from the National Commission for Science, Technology and Innovation (NACOSTI), (APPENDIX 4). The researcher thereafter requested authorization to collect data from the management of the target firms and the respondents prior to their engagement.

The notion of voluntary involvement and informed consent was implemented willingly.

In the course of the research, it was imperative to safeguard the respondents from unethical practices by elucidating the rationale behind the study and the measures implemented to uphold the confidentiality of all collected data and the privacy of the participants. The subsequent actions were executed prior to, during, and subsequent to the research.

A Non-Disclosure Agreement (NDA) was executed between the respondents and the researcher prior to the commencement of data collection. The NDA aimed to ensure the confidentiality of the respondents. In this context, the respondent's personal information shall stay private, their details will be kept anonymous, and the completed questionnaire will be absolutely confidential with the researcher.

A sample of the NDA form is attached in Appendix 2.

## **CHAPTER FOUR: DATA ANALYSIS AND PRESENTATION**

### **4.0 Overview of the Chapter**

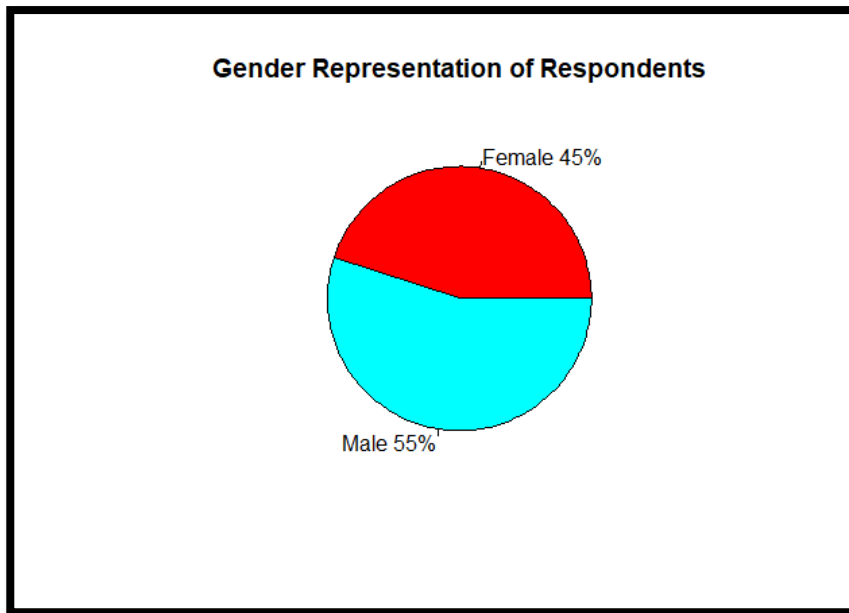
This chapter presents the analyzed data and interpreted results obtained from the survey and interviews. The analysis was conducted using both descriptive and

inferential statistics to test relationships among the identified constructs. The findings are organized and presented from section 4.1 to section 4.8. Section 4.9 provides the regression analysis and the high-level model summary. The proposed disruptive ICT model design is discussed in section 4.10 and a descriptive summary of findings is given.

## **4.1 Demographic Factors**

### **4.1.1 Distribution of sample by Gender**

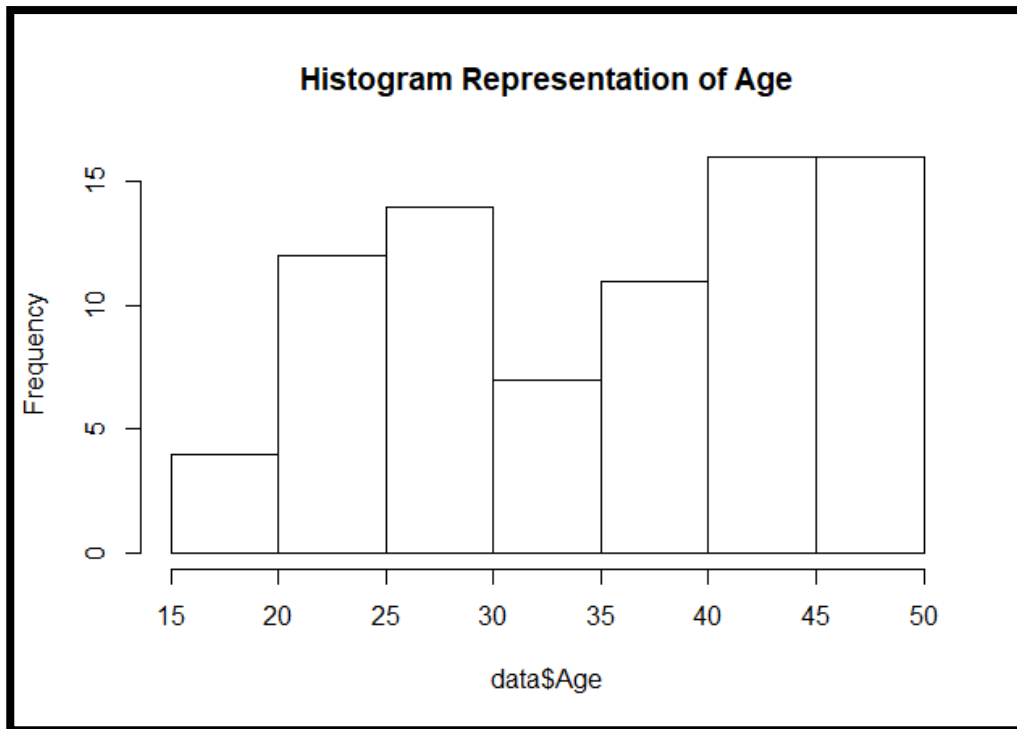
The research sought to find out the gender of the respondents who took part in the research, the essence of this question was to ensure that the research was not gender biased. The research indicated that the number of females who participated on the research was 45% of the population while the men who participated on the research were 55% of the total respondents showing that all genders were involved in the research, the males were more than the females because majority of the technology careers are dominated by men compared to women and hence the difference in percentages.



**Figure 4.1: Respondents Gender**

#### **4.1.2 Distribution by age**

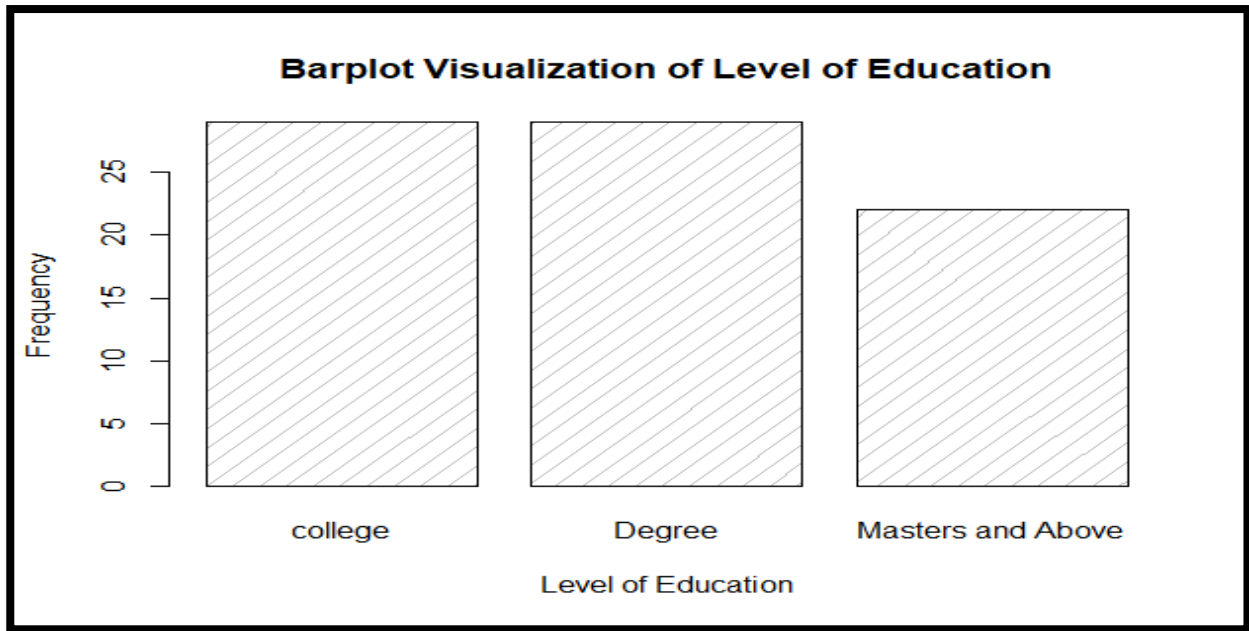
The research sought to find out the age of the respondents who participated in the data collection of the process, the essence of asking their age as to be able to establish whether or not the people who responded on the research questions fell in the targeted group. The histogram visualization of age is skewed left which implies that the median age of the respondents is greater than the average, this is evident since the mean age is 35 years while the median is 36 years. The minimum age of the respondents was 18 years while the respondent with the highest age was 50 years, the ages of the respondents are appropriate since people in this age bracket and are in the technology careers are productive therefore, they would offer great insights on the research topic.



**Figure 4.2: Respondents age**

#### **4.1.3 Level of Education**

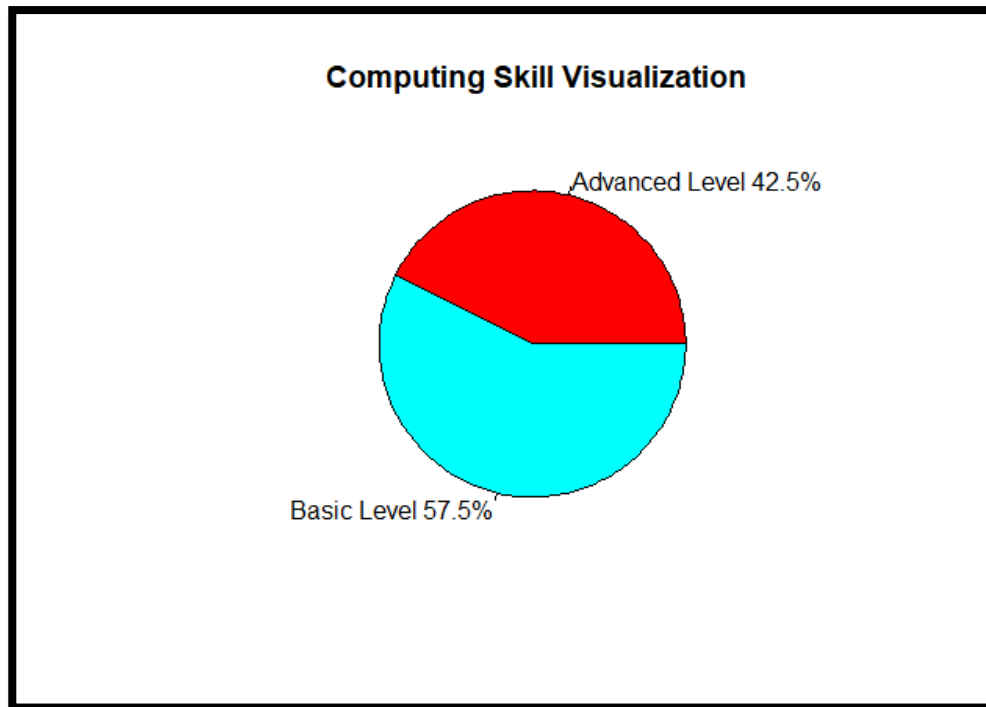
The research asked the level of education of the participants that took part in this research, the intent of this question was to be able to establish whether the respondents were in the capacity to be able to respond to the questions that the research asked. The bar plot visualization indicates that out of the 80 respondents 29 had attained college level of education, 29 had attained a degree level of education while 22 of them had masters and above level of education. The results indicated that all the respondents who participated in the study were competent enough and the responses they provided regarding the research were things that they would be relied upon for this research.



**Figure 4.3: Respondents level of education**

#### **4.1.4 Level of Skills in Computing**

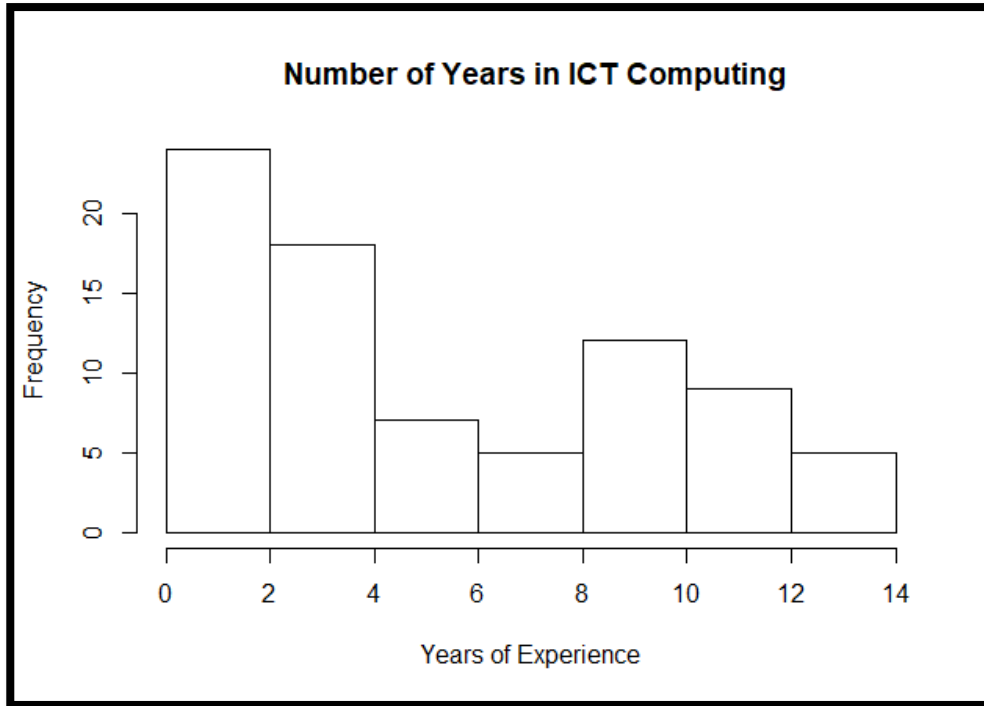
The research inquired the level of skill in the field of computing whose intent was to establish how competent they were in the field of computing; this was relevant as the reliability of the responses given in the research would be greatly be contributed by how well someone is skilled. The analysis revealed that 42.5% of the respondents had basic level skill in computing while 57.5% of the respondents had advanced level of computing, this reveals that the respondents who took part in this research are people who are vast in the computing arena and therefore the answers that are provided are reliable as they are coming from people who are well aware of computing.



**Figure 4.4: Respondents level of skills in ICT**

#### **4.1.5 Years of Experience**

The respondents were asked about their years of experience whose intent was to know their experience in the computing world, a histogram visualization indicating the years of the respondents which is right skewed implying that the years of experience of the respondents which is 5.6 is greater than the median years of experience which is 14; the highest number of years of experience is 14 years while the least is 0.



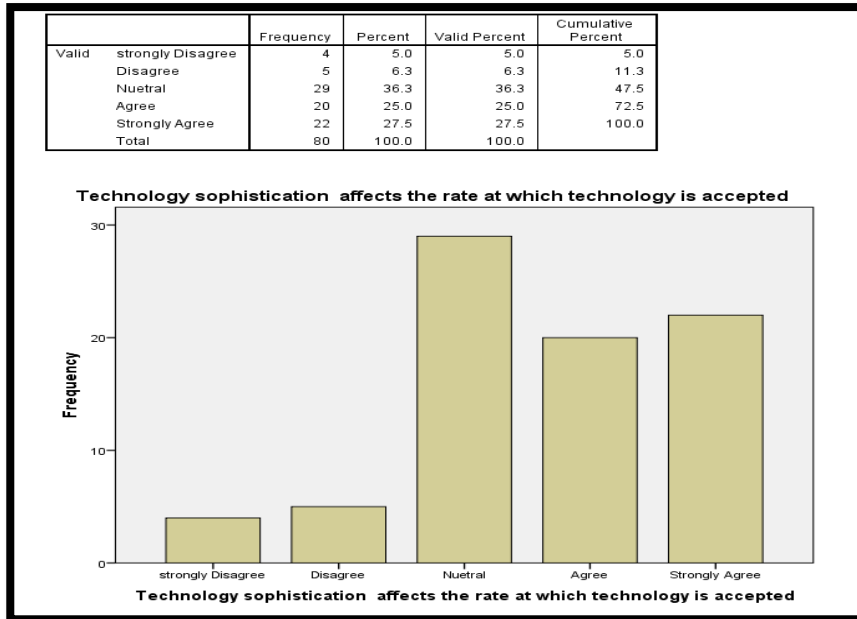
**Figure 4.5: Respondents year of work experience**

## **4.2 Innovation Structure**

The question sought to find out whether how an innovation is structured determines its success, to unveil this the research had various questions which are as follows:

### **4.2.1 Technology sophistication affects the rate at which an ICT innovation is accepted**

The research sought to find out the sophistication of a technology from which an innovation an innovation is based determines the success of the innovation. Results from the respondents revealed that 27.5% Strongly Agreed, 25% agreed, 36.3% gave a neutral response, 6.3% disagreed while 5% strongly disagreed.

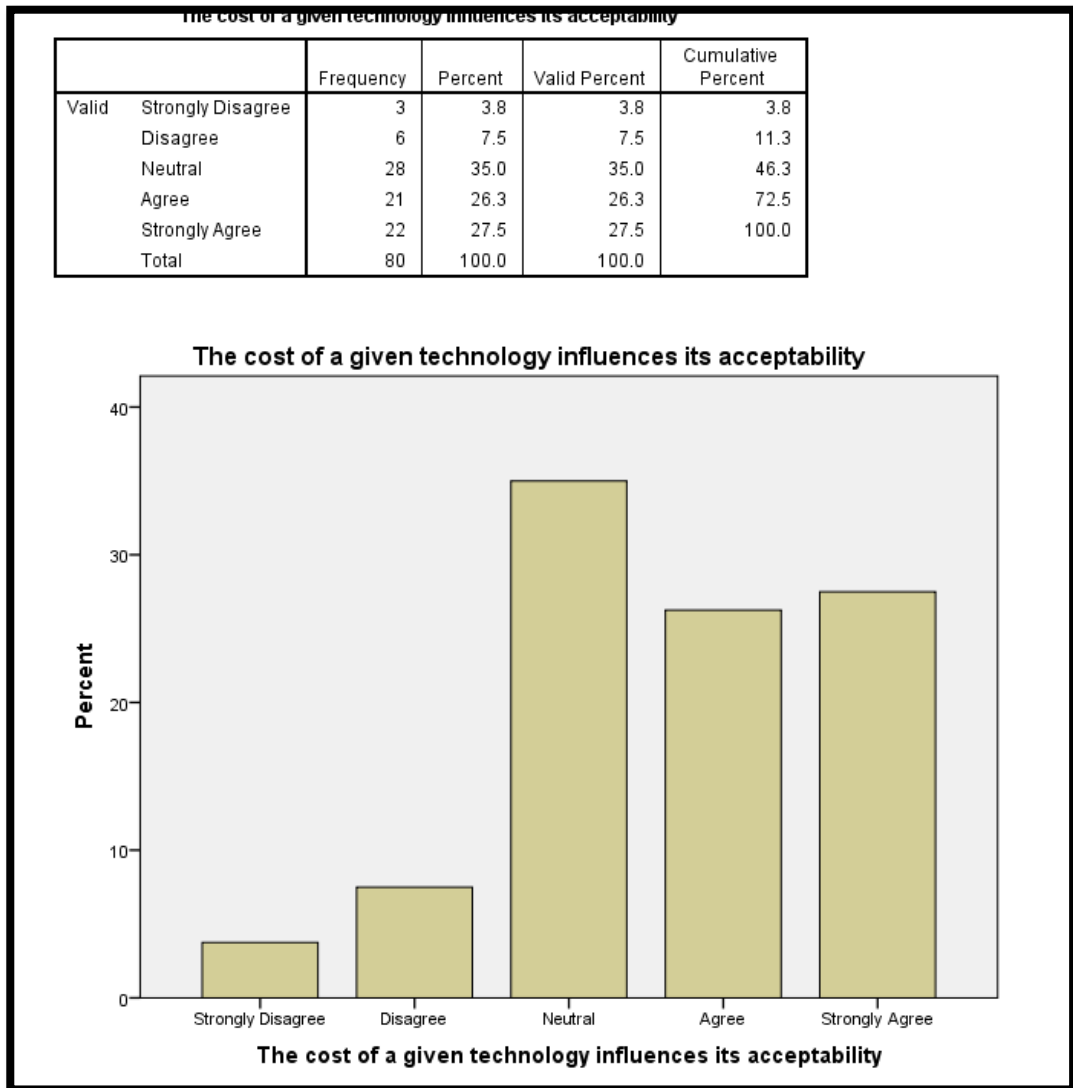


**Figure 4.6: analysis of the considered effect of ICT sophistication on acceptability**

#### **4.2.2 Cost of a given Technology Influences its Acceptability**

The respondents were asked to give their thoughts on whether the cost a given technology determines on whether or not people Accept it, 3.8% of the respondents strongly disagreed, 7.5% Disagreed,35% gave a neutral response while 26.3% agreed

and 27.5% strongly agreed.



**Figure 4.7: effect of cost of technology on acceptability**

### **4.2.3 The cost of related hardware and software is critical to the acceptability of a given ICT**

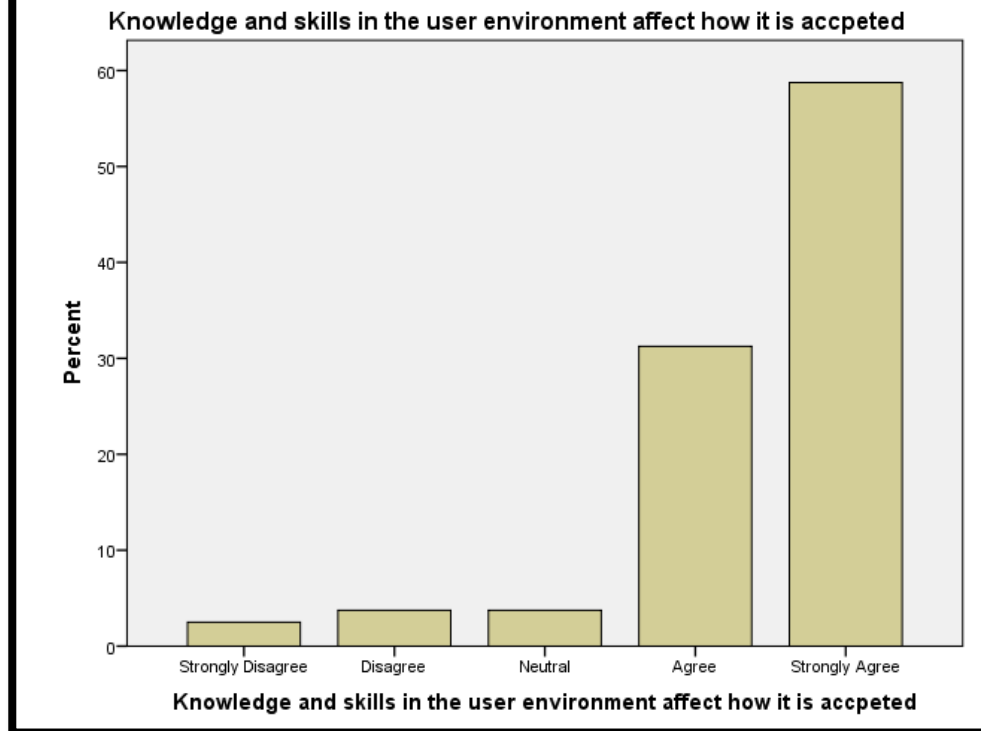
The research aimed at finding out whether there is any relationship between the cost of the software, hardware of a given innovation and it being acceptable to people. The respondents who strongly disagreed constituted to 6.3%, those who disagreed were

3.8%, those who neutral response constituted to 41%, those who agreed constituted 22.5 while who strongly agreed constituted 26.3%.

#### **4.2.4 Knowledge and skills in the user environment affect how it is accepted**

The question sought to find out whether the skills available determines whether or not the innovation is acceptable, the research established that 56.8% strongly Agreed, 31.3% Agreed, 3.8% gave a neutral response, 3.8% Disagreed while 2.5% of the total responses Strongly Agreed.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	2.5	2.5	2.5
	Disagree	3	3.8	3.8	6.3
	Neutral	3	3.8	3.8	10.0
	Agree	25	31.3	31.3	41.3
	Strongly Agree	47	58.8	58.8	100.0
	Total	80	100.0	100.0	



**Figure 4.8: ICT knowledge and skills by the users influences the acceptability of an innovation**

#### 4.2.5 ICT innovation architecture affects the performance of an innovation

The research sought to find out whether how an innovation has been designed has anything to do with how effective an innovation will perform, the respondents responded in the following manner whereby 38.8% of the respondents strongly Agree, 50% of the respondents agreed, 5% Disagreed and 6.3% Strongly Disagreed.

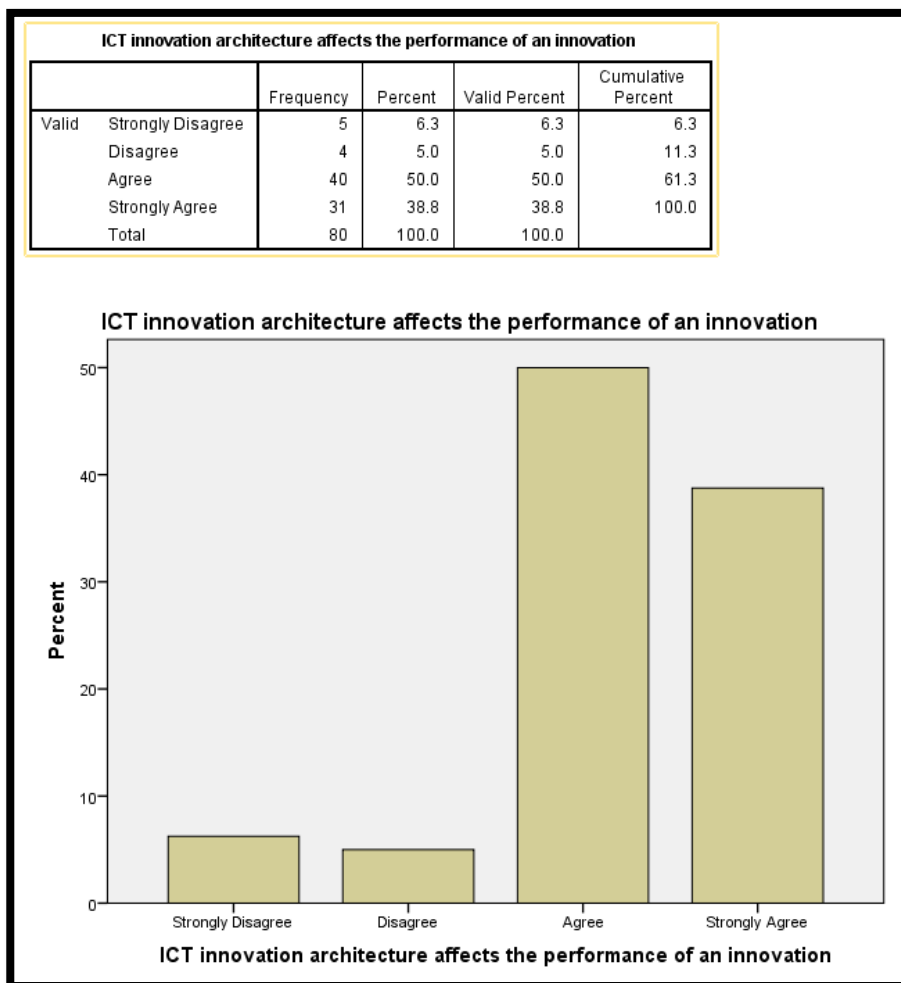


Figure 5.9: ICT innovation architecture affects its acceptability

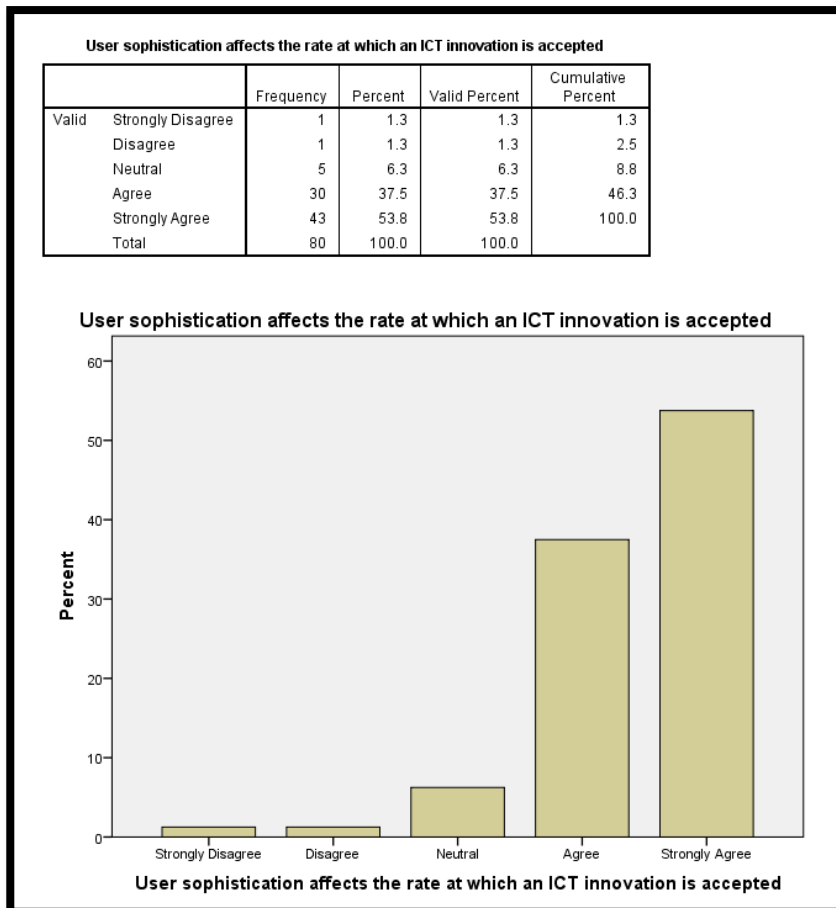
### **4.3 ICT Implementation Environment**

The study sought to find out whether or not the success of an innovation is pegged on how the environment under which the innovation will be implemented upon looks like. The research sought to ask the following questions to find out whether it held truth, the questions are as follows:

#### **4.3.1 User sophistication affects the rate at which an ICT innovation is accepted**

Respondents were asked whether how sophisticated the user base model determines the rate at which the innovation is accepted, they gave varying answers which are as follows:

53% strongly Agreed, 37.5% Agreed, 6.3% gave a neutral response while those that Disagreed and Strongly Disagreed consisted 1.3% each.



**Figure 4.10: User sophistication influences the acceptability of an ICT**

#### **4.3.2 Acceptability of a given innovation affects its diffusion**

The study sought to find out whether if an innovation is generally accepted by the targeted people, it will be able to spread across the region, the research made the following observations. 36% strongly agreed,43% agreed,10% gave a neutral response,8% disagreed while 4%strongly Disagreed.

### 4.3.3 Perception of an ICT innovation influences its adoption by users

The research sought to find out whether if an innovation can be easily accessible by the target group it can have an influence in its adoption, 28.7% of the respondents strongly Agreed,35% Agreed,25% gave a neutral response while 7.5% Disagreed and 3.6% Strongly Agreed.

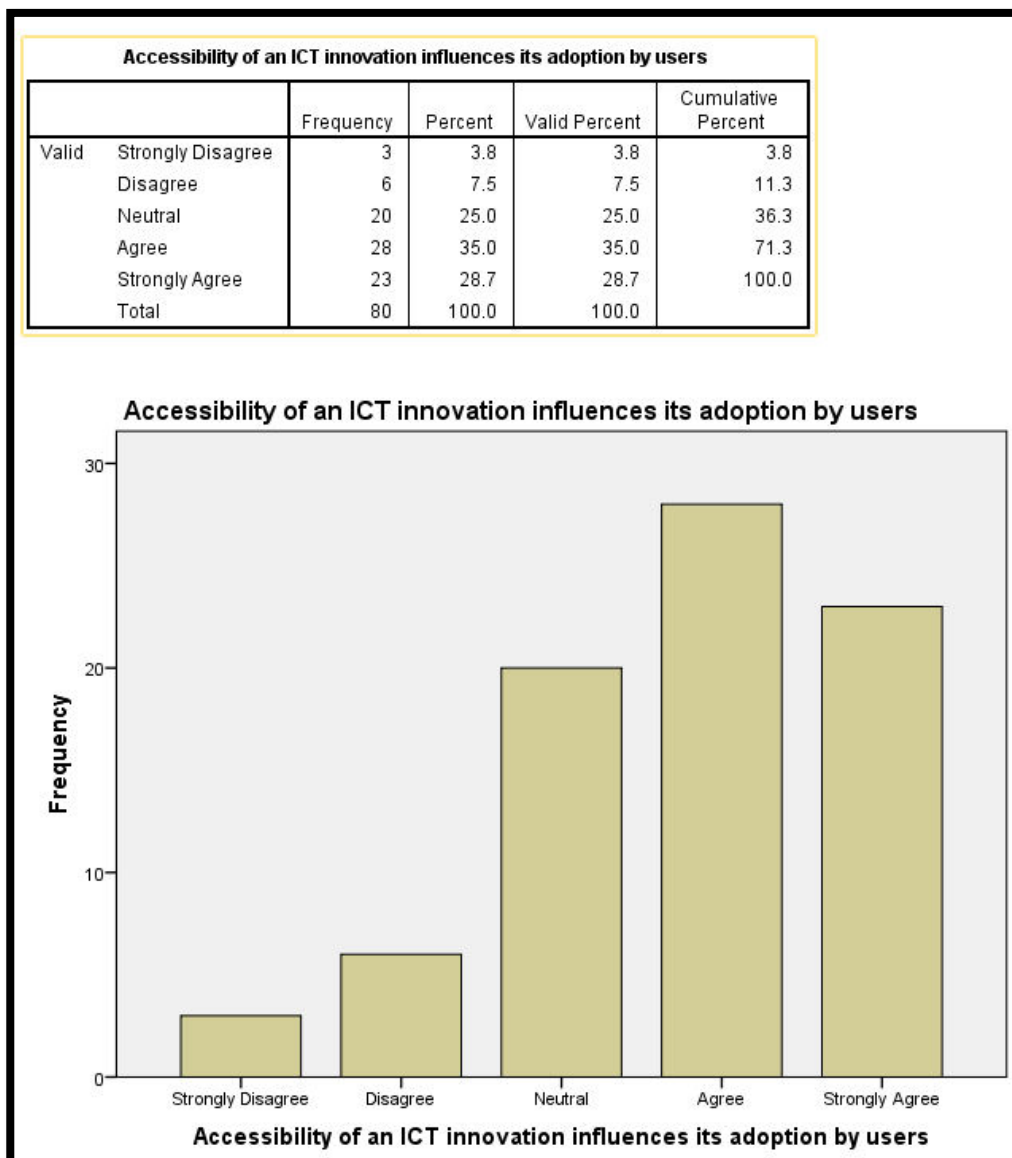


Figure 4.11: Accessibility of an ICT innovation influences its adoption

#### 4.3.4 ICT innovation environment affects the success of an innovation

The research sought to find out whether or not the innovation's environment determines its success, the observations that were made are as follows; 40% strongly Agree, 47.5% Agree, 5% gave a neutral response, 3.8% of the respondents disagreed and 3.8% strongly Agreed.

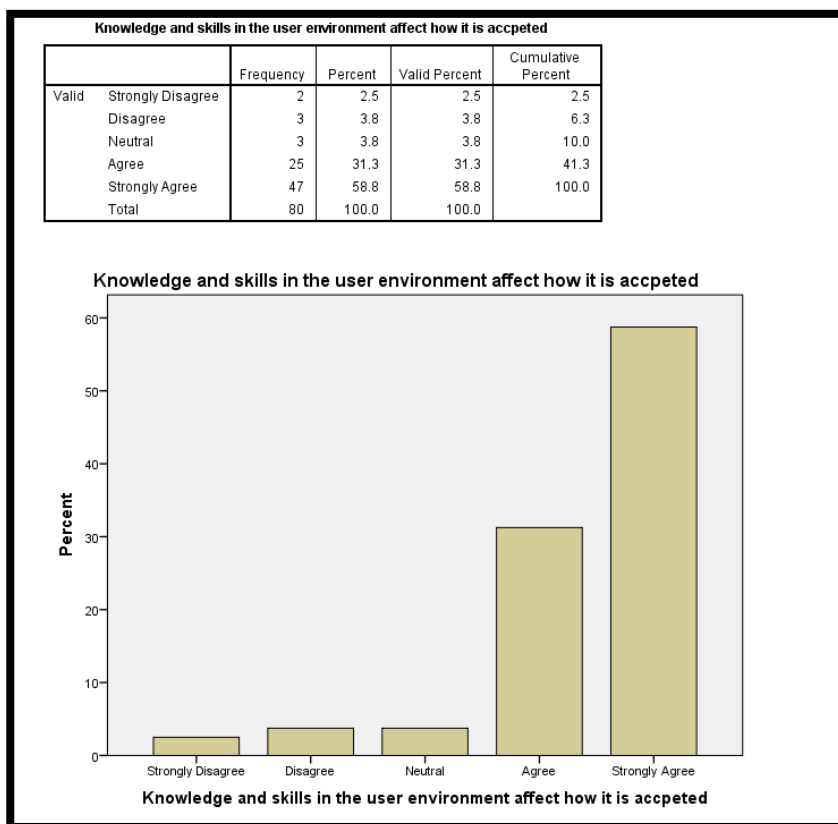


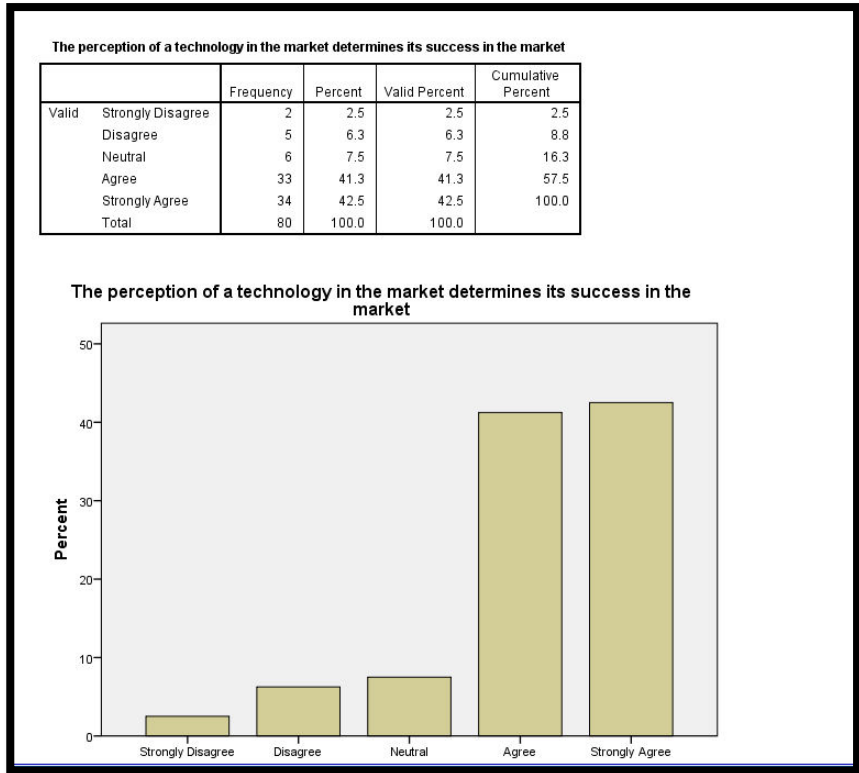
Figure 4.12: User environment influences adoption of an ICT

#### **4.4 Market Structure**

The research sought to find out the factors that would affect the innovation in the market, it asked the following questions to the respondents who took part in the research to establish how the market structure would have an effect on the innovation.

##### **4.4.1 The perception of a technology in the market determines its success in the market**

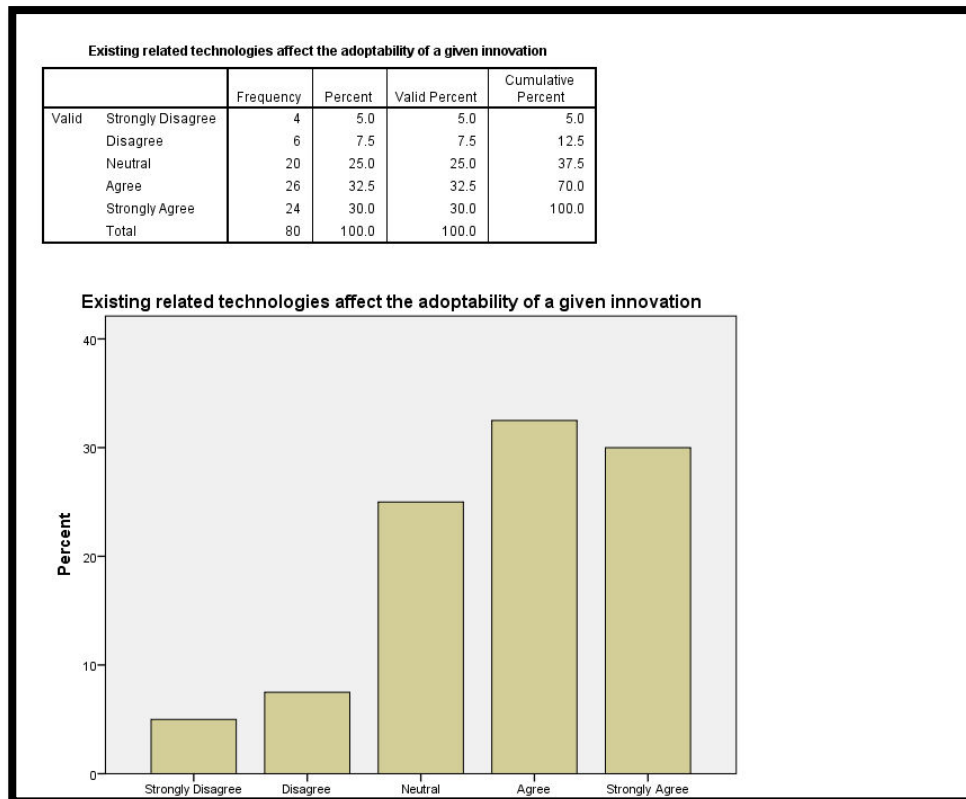
The research sought to find out whether how people may perceive a technology might have an impact of an innovation as it enters into the market. The outcome of the research was as follows:42.5% strongly Agreed,41.3% Agreed, 7.5% gave a neutral response, 6.3% Disagreed while 2.5% strongly Disagreed.



**Figure 4.13: perception of an ICT innovation influences adoption**

**4.4.2 Existing related technologies affect the adoptability of a given innovation**

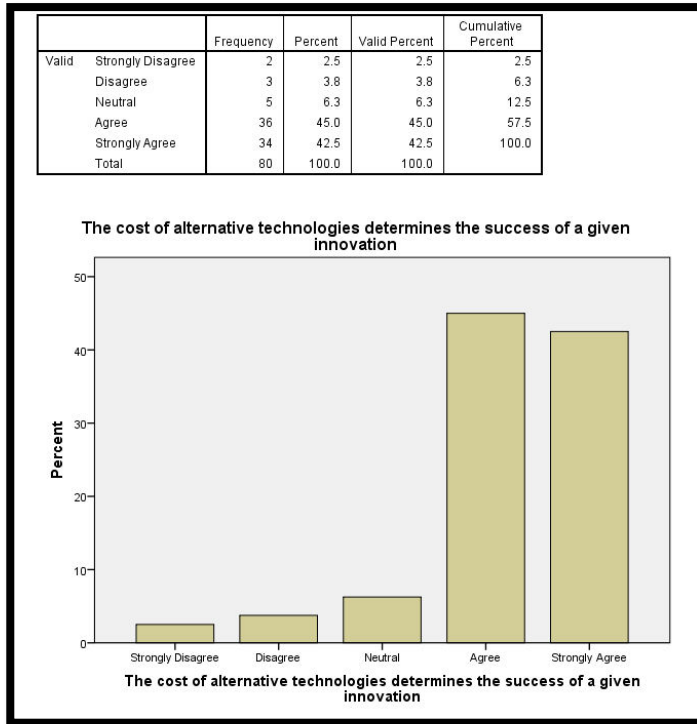
The research sought to find out whether the presence of other technologies in the market has an effect to the adoptability of a new innovation, the question sought to find out whether the innovation can be easily adopted in the market while there are similar innovations. The observations are as follows;30% strongly Agreed, 32.5% Agreed,25% gave a neutral response,7.5% Disagreed and 5% Strongly Disagreed.



**Figure 4.14: Existing related technologies influence the success of an ict innovation**

#### **4.4.3 The cost of alternative technologies determines the success of a given innovation.**

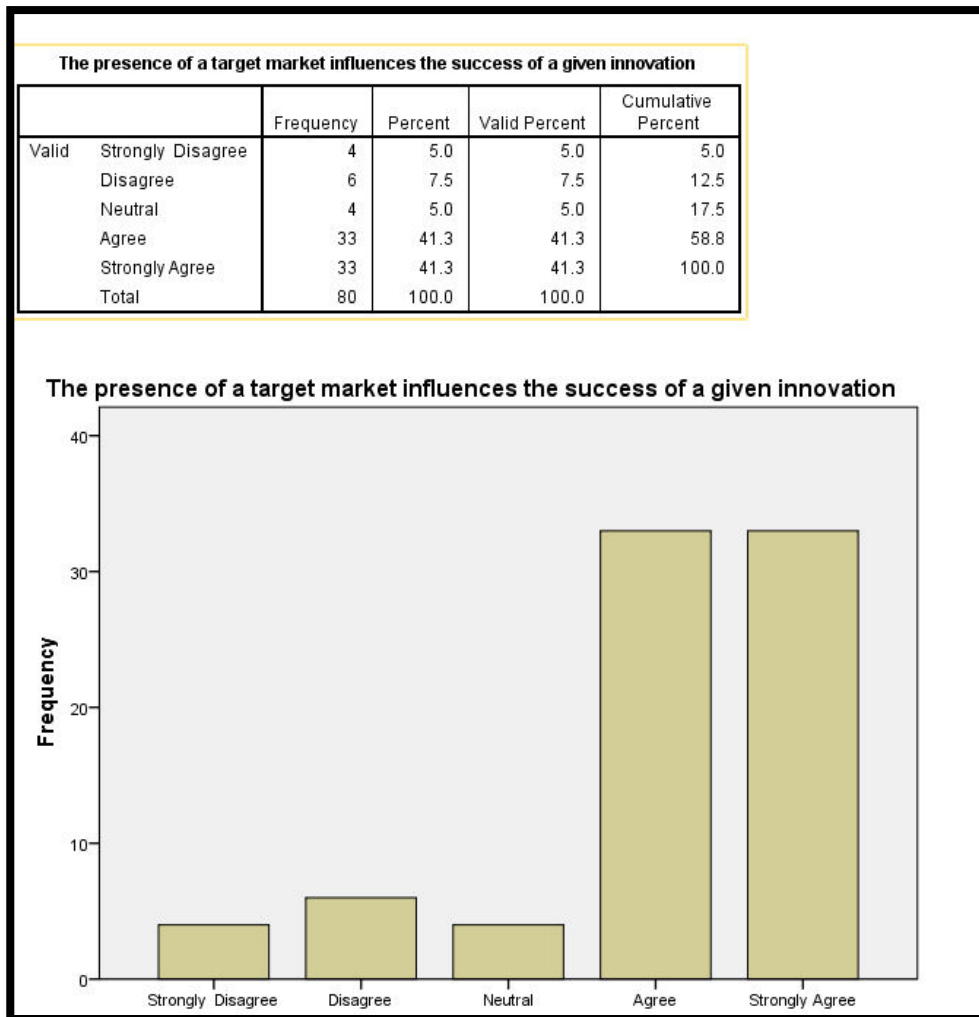
The research sought to establish whether the prices of alternative technologies in the market has an effect on how successful a new innovation will be in the market. The outcome was as follows; 42.5% strongly agree, 45% are agree, 6.3% gave a neutral response while 3.8% disagreed and 2.5% strongly disagreed.



**Figure 4.15: Cost of alternative technologies influence the success of an ICT innovation**

#### **4.4.4 The presence of target market influences the success of a given innovation**

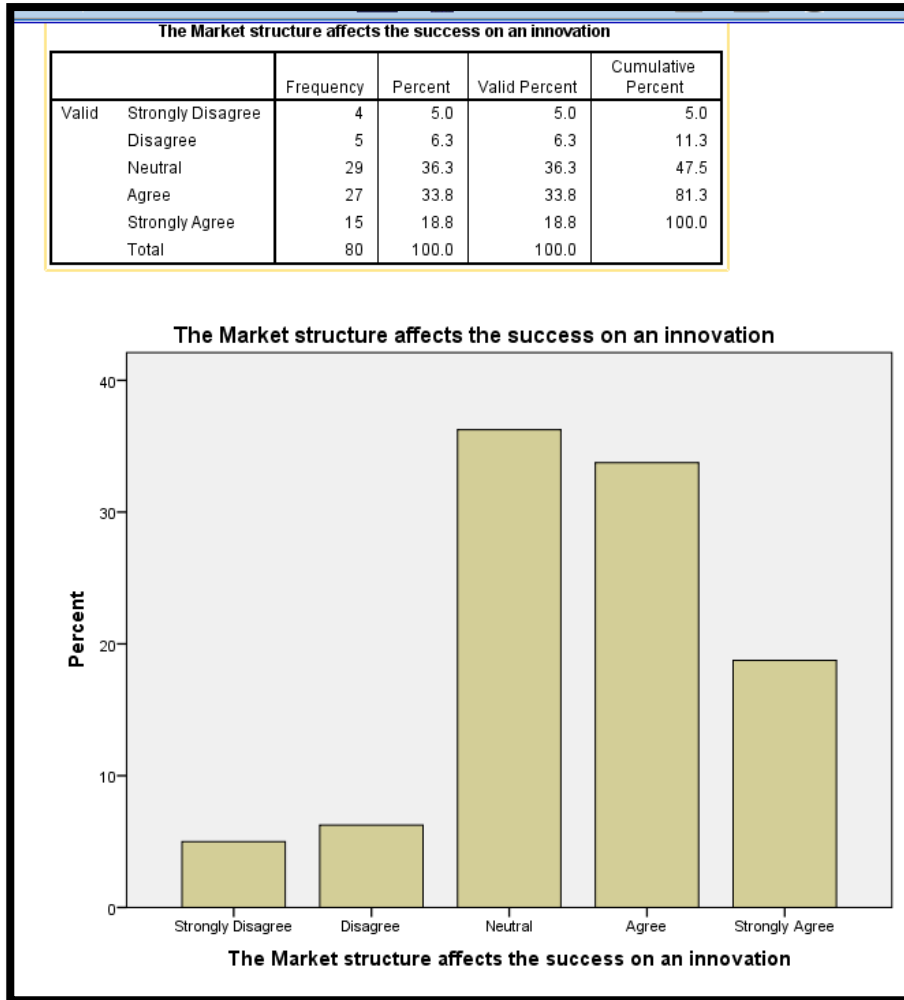
The research sought to find out whether the presence of a target has an impact on how a given innovation may be successful, the analysis of the data revealed that 5% of the respondents strongly disagreed while 7.5% of the respondents disagreed, 5% gave a neutral response as those that agreed and strongly agreed constituted 41.3% respectively.



**Figure 4.16: Target market influences the success of a given ICT innovation**

#### **4.4.5 Market Structure affects the success of an innovation**

The respondents were asked whether to give their inputs on whether the market structure of an innovation is has an influence on the success of the innovation. The outcome of the results were 5% of the respondents strongly agreed while 6.3% disagreed as 36.3% gave a neutral response 33.8% agreed and 18.8% strongly agreed.



**Figure 4.17: Market structure influence on the success of an ICT innovation**

#### **4.5 Government Regulations**

The research sought to find out whether or not regulations that have been put into place by the government have any impact on any innovation that is about to be rolled out, the research asked several questions to the respondents in a quest to find out whether government regulations have any effect on innovations.

#### 4.5.1 Government regulations influence the performance of ICT innovations

The research sought to find out whether the performance of any innovation is in any way affected by government regulations, 17.5% strongly disagreed, 8.8% gave a neutral response, 37.5% agreed while 36.3 strongly agreed.

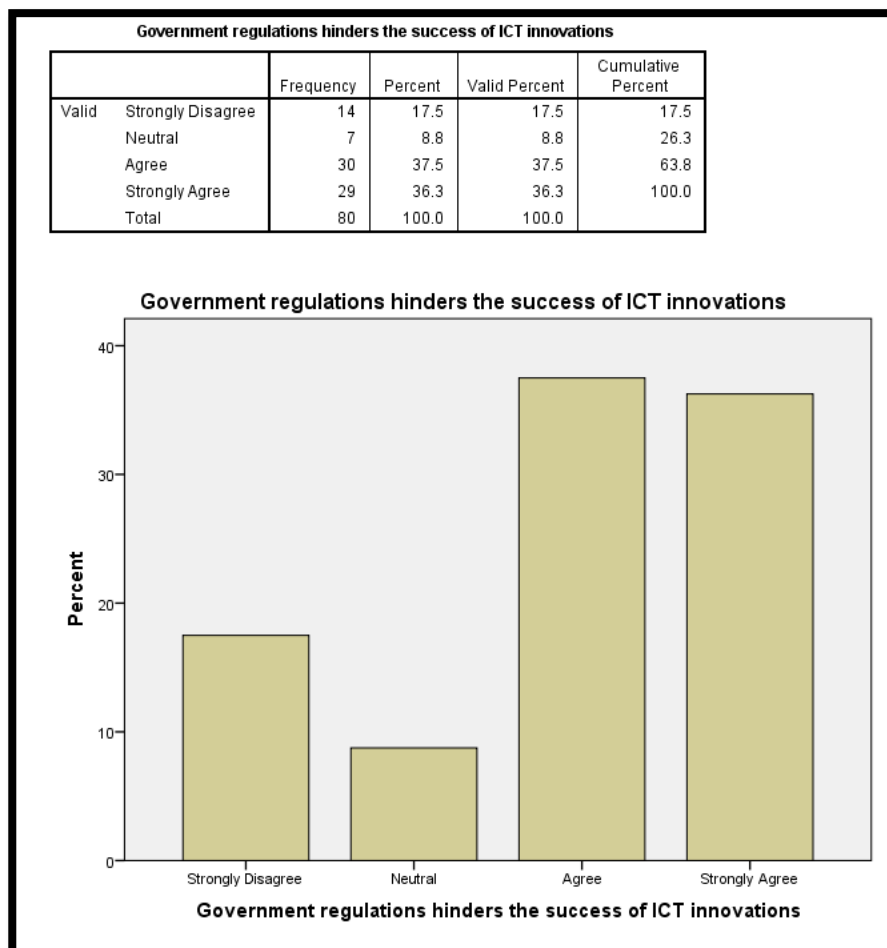
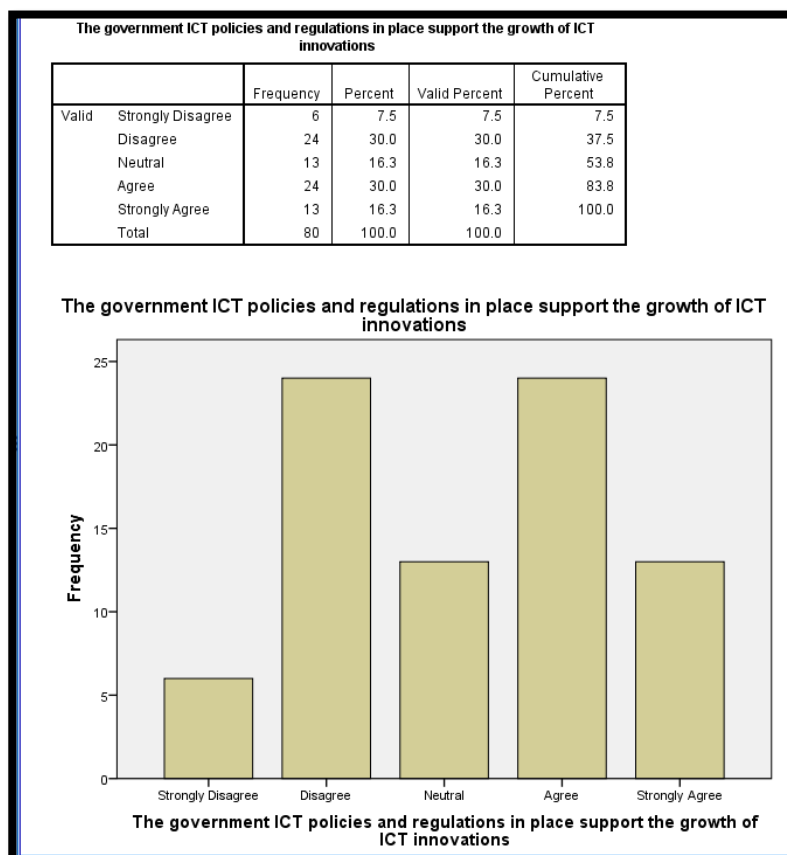


Figure 4.18: Government regulations influence the success of ICT innovations

#### 4.5.2 The government ICT policies and regulations in place support the growth of ICT innovations.

The research sought to find out whether the already ICT policies that have been put into place by the government enhance the growth of ICT innovations, 16.3% of the respondents strongly agreed while 30% agreed and those that gave a neutral response constituted 16.3%, 30% disagreed while 7.5% strongly disagreed.

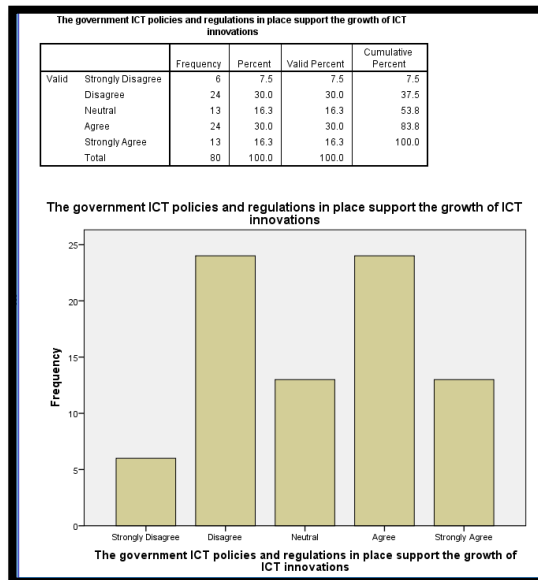


**Figure 6.19: ICT policies influence ICT innovations success**

#### 4.5.3 Taxation measures are supportive of the developments in ICT

The research sought to find out whether the taxation measures are friendly to the ICT innovations, the results of the research were as follows: 12.5% of the respondents

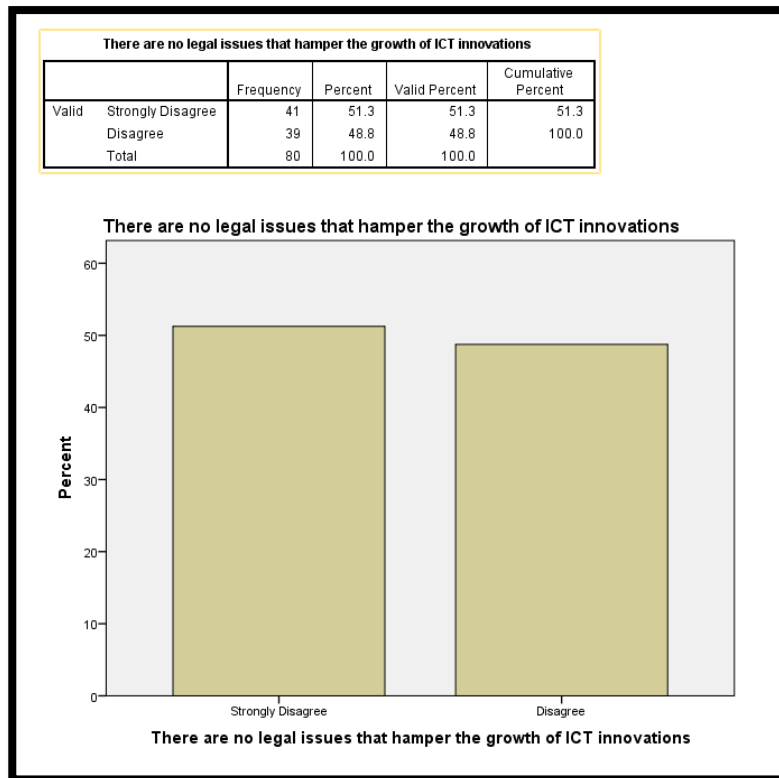
strongly agreed as 11.3% of the respondents agreed, 30% gave a neutral response, 20% disagreed and 26.3% strongly disagreed.



**Figure 4.20: taxation measures influence ICT innovation success**

#### 4.5.4 There are no legal issues that hamper the growth of ICT innovations

The research sought to find out whether there are legal obstructions that hinder the development of ICT innovation, 51.3% of the respondents disagreed while 48.8% strongly disagreed.



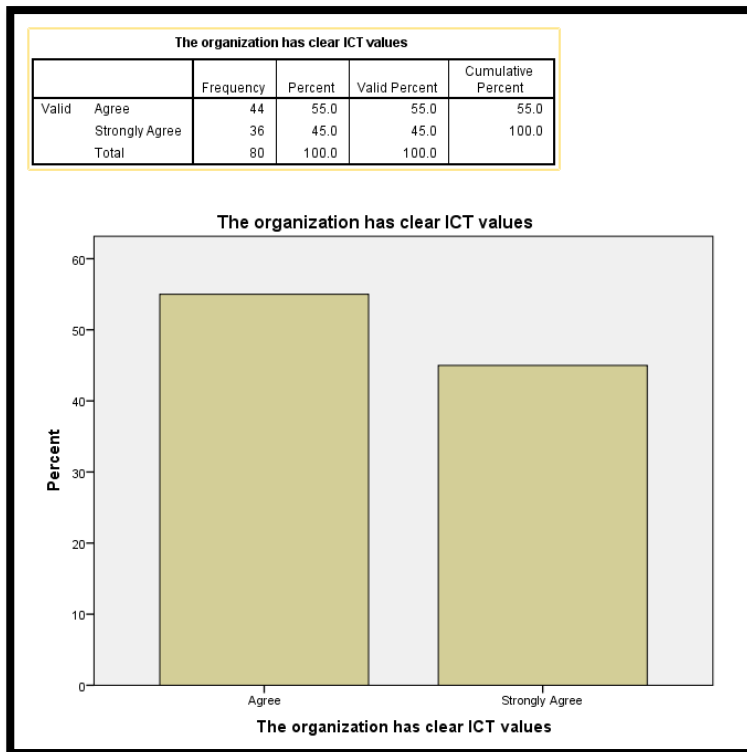
**Figure 4.21: legal issues in ICT implementations influence ICT innovations success**

#### **4.6 Organizational ICT values**

The values of any organization hugely determines whether growth is a priority in the given organization or not. To find out this, the research sought to find out whether the organization ICT values can foster growth of the ICT innovations.

##### **4.6.1 The organization has clear ICT values**

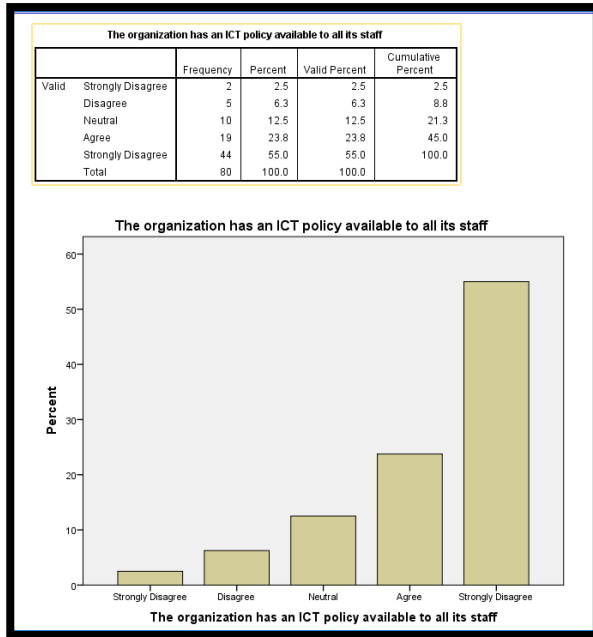
The research sought to find out whether the ICT values that have been set are clear to everyone in the organization, 55% of the respondents agreed as 45% of the respondents strongly agreed.



**Figure 4.22: there exists an ICT values in the organization**

#### **4.6.2 The organization has an ICT policy available to all its staff**

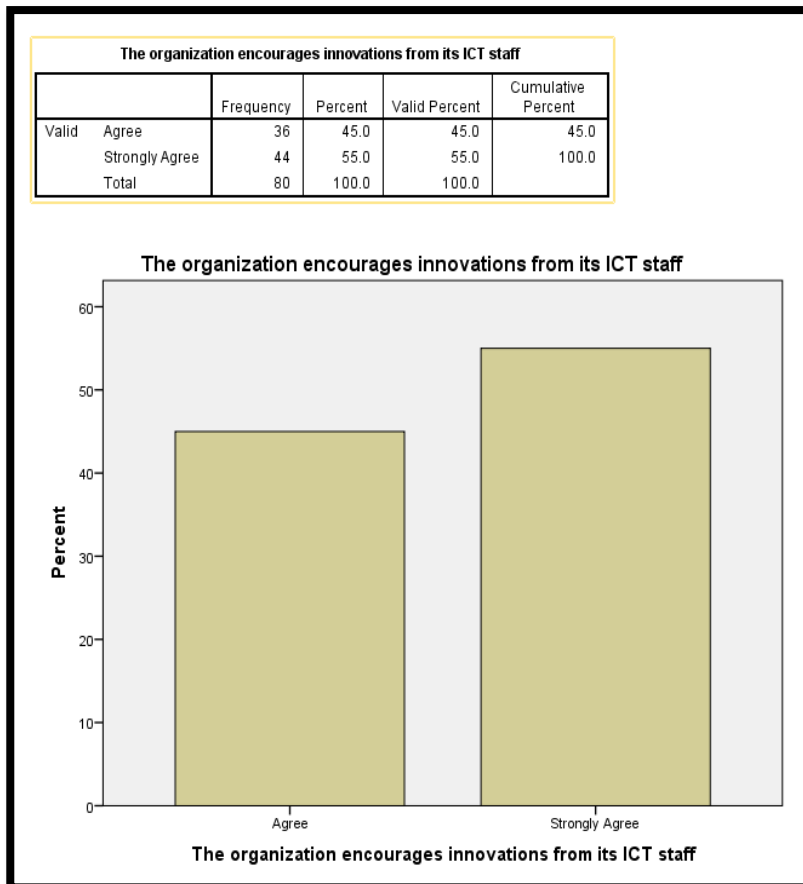
The research sought to find out whether the ICT policy is usually available to everyone in the organizations so that they can be able to interact with it. Among the respondents that took place on the study 55% of them strongly disagreed, 23% agreed, 12.5% gave a neutral response, 6.3% disagreed as 2.5% strongly disagreed.



**Figure 4.23: organization has an ICT policy**

#### **4.6.3 The organization encourages innovations from its ICT staff**

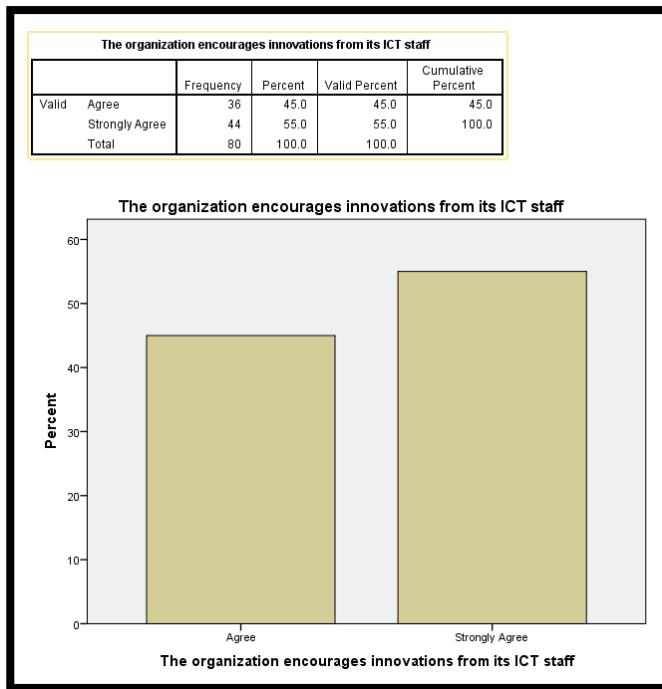
The research sought to find out whether organizations support ICT staffs in any form support, 45% of the respondents agreed as the 55% of the respondents strongly agreed.



**Figure 4.24: support for ICT innovators in the organization**

#### **4.6.4 ICT personnel are rewarded for their innovative idea**

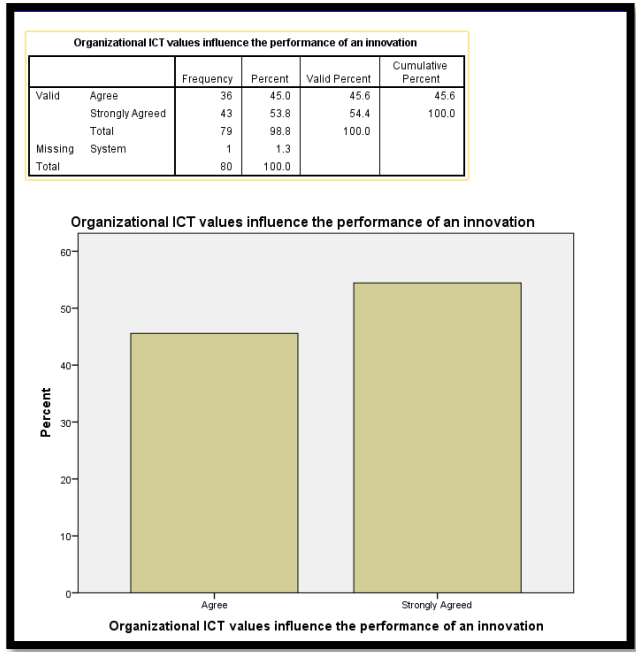
The research sought to find out whether those staffs who come up with ICT innovative ideas are usually encouraged to continue coming up with new innovations. 45% of the respondents agreed while 55% of the respondents strongly agreed.



**Figure 4.25: there are rewards for ICT personnel innovators in the organization**

#### **4.6.5 Organizational ICT values influence the performance of an innovation**

The research sought to find out from the respondents whether they think that Organizational ICT values can foster the performance of ICT innovations with 45.6% of the respondents agreeing and 54.4% strongly agreeing.



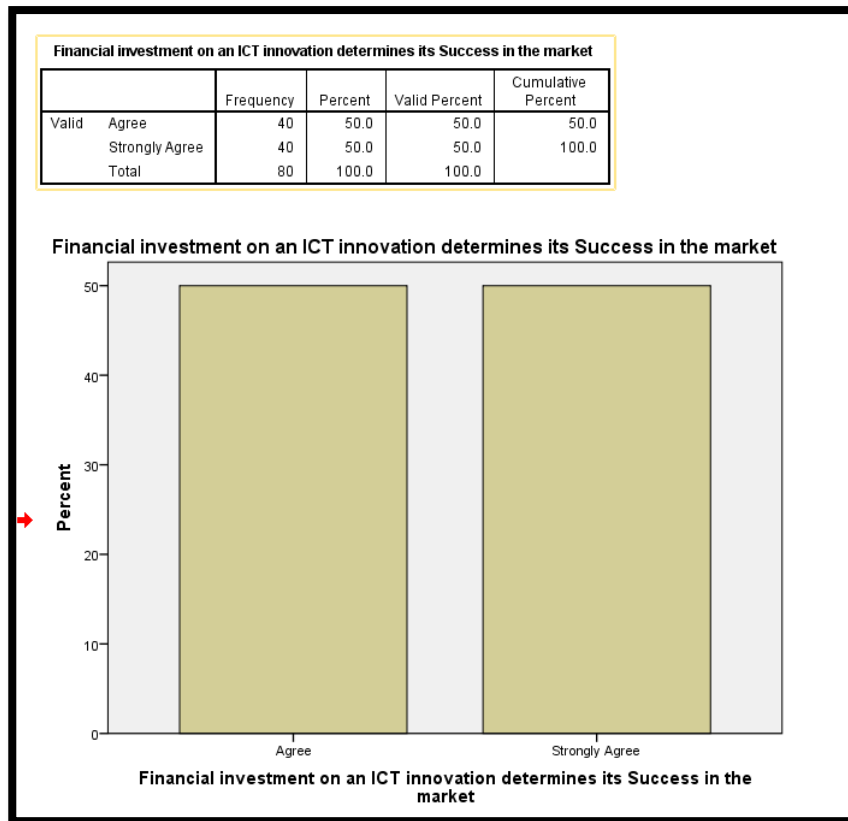
**Figure 4.26: Organization ICT values influence the success of an ICT innovation**

**4.7 Financial investment in ICT innovations.**

The research sought to find out whether with more financial investments directed to ICT innovations would encourage more innovations on ICT.

**4.7.1 Financial investment on an ICT innovation determines its Success in the market.**

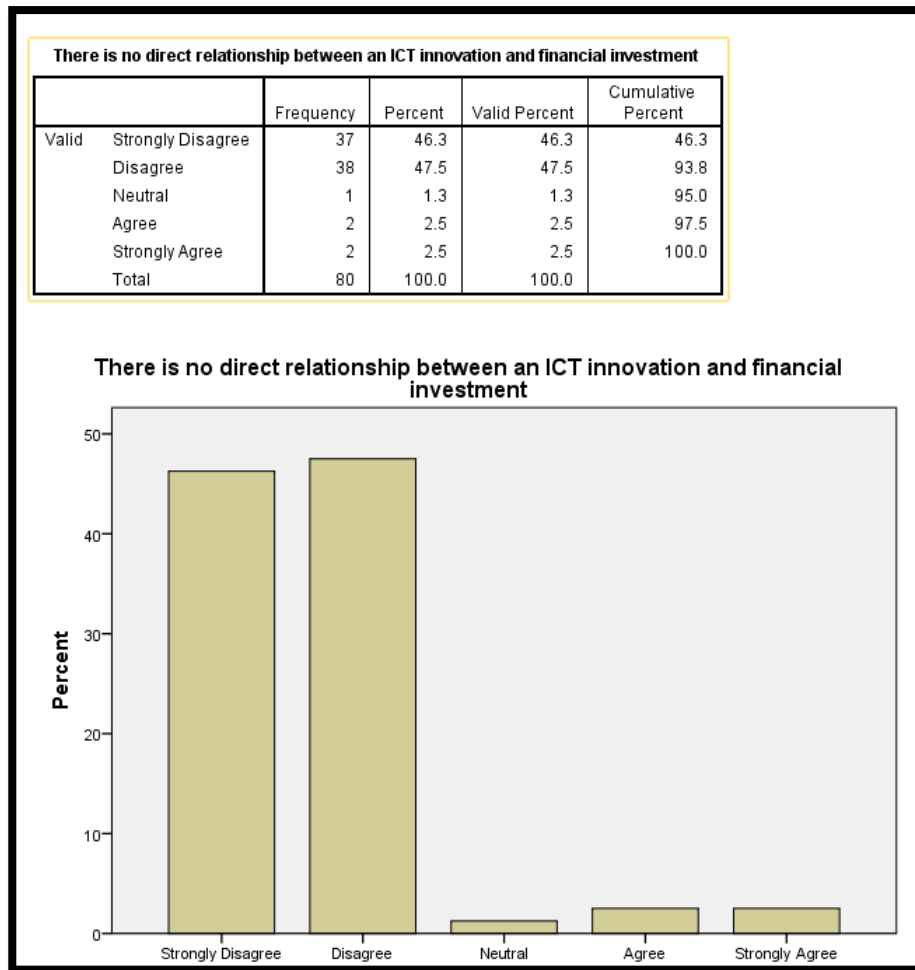
The research sought to find out whether the level of financial investment made on an ICT innovation determines how successful the innovation will be in the market. 50% of the respondents agreed and the remaining 50% of the respondents strongly agreed too.



**Figure 77: Financial investments in ICT innovations influence the success of ICT innovations**

#### **4.7.2 There is no direct relationship between an ICT innovation and financial investment**

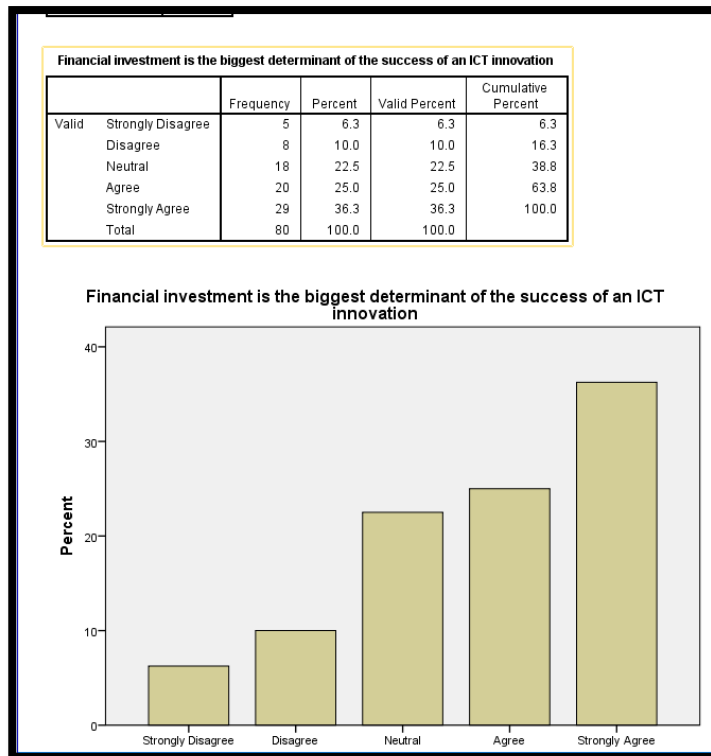
The research sought to find out whether there exists any correlation between ICT innovation and financial investment. 46.3% of the respondents strongly disagreed as 47.5% of the respondents agreed, 1.3% of the respondents gave a neutral response while those who agreed and strongly agreed constituted 2.5% each.



**Figure 4.28: there is a relationship between ICT innovations and financial investments in ICT**

### **4.7.3 Financial investment is the biggest determinant of the success of an ICT innovation.**

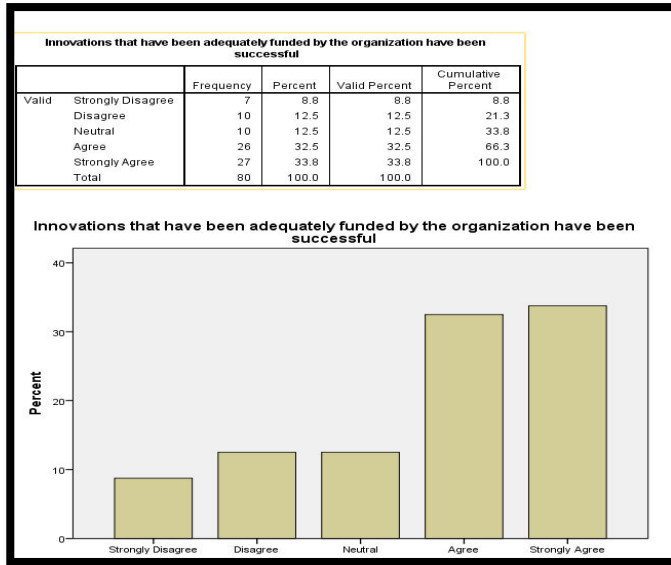
Respondents were asked whether the amount of financial investment made in an ICT innovation is a great deal breaker on whether or not the innovation will be successful. 36.3% of the respondents strongly agreed, 25% agreed, 22.5% gave a neutral response, 10% disagreed while 6.3% strongly disagreed.



**Figure 4.29: Financial investments is the biggest determinant of ict innovation success**

#### **4.7.4 Innovations that have been adequately funded by the organization have been successful**

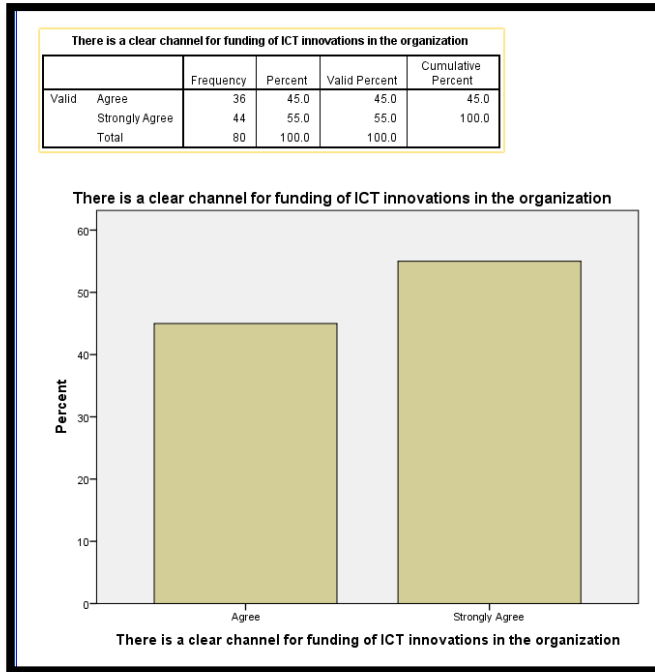
Respondents were asked whether they think believe that some of the innovations that have emerged to be among the most successful can be said to have been well funded, this question aimed to establish whether for a innovation to be successful it has to be well funded. 33.8% of the respondents strongly agreed, 32.5% agreed,12.5% of the respondents gave a neutral response, those that strongly disagreed constituted 8.8% and those that disagreed constituted 12.5%.



**Figure 4.30: adequate funding influences ICT innovation success**

#### **4.7.5 There is a clear channel for funding of ICT innovations in the organization**

The research sought to find out whether there is a stipulated channel where funding of ICT innovations is done, this question sought to address the question of transparency and accountability on funding ICT innovations. 45% of the respondents agreed as 55% of the respondents strongly agree.



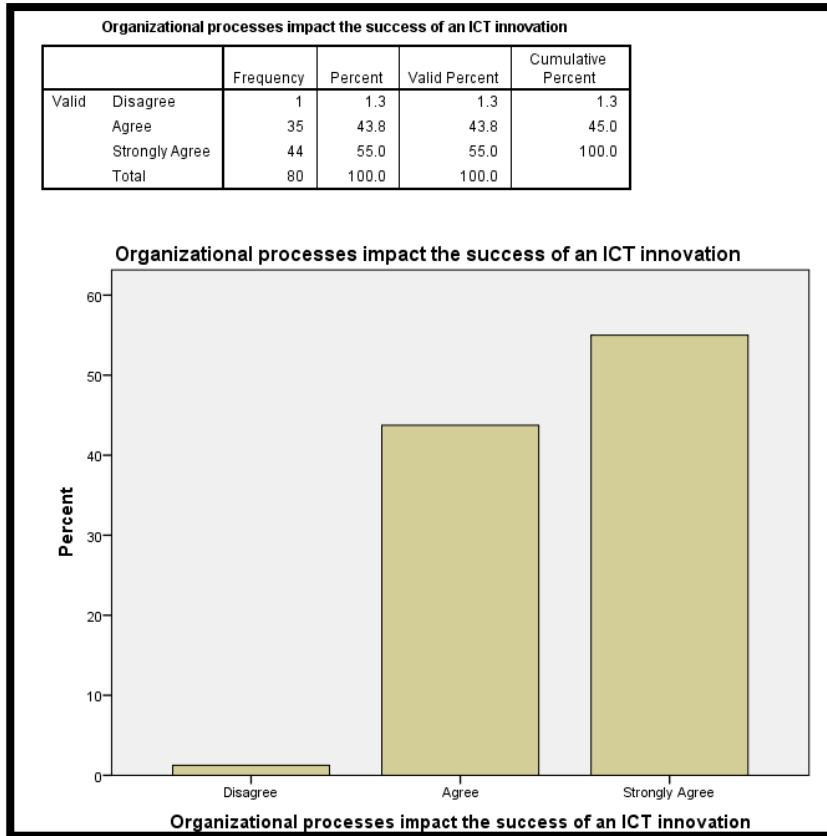
**Figure 8: the organization has funds set aside for support of ICT innovations**

#### 4.8 Organizational Processes

The research sought to find out whether the organizational processes have an impact on the success of an ICT innovation.

##### 4.8.1 Organizational processes impact the success of an ICT innovation

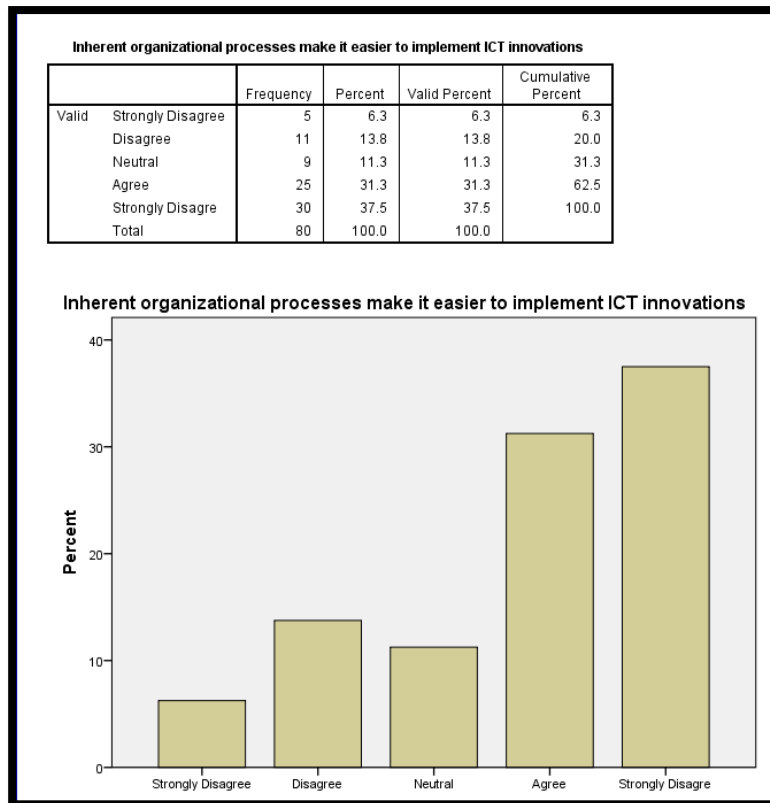
Respondents were asked whether the organizational processes have any impact on how successful an ICT innovation will be, 55% of the respondents strongly agreed, 43.8% agreed and 1.3% disagreed.



**Figure 4.32: Organizational processes influence ICT innovations success**

#### **4.8.2 Inherent organizational processes make it easier to implement ICT innovations**

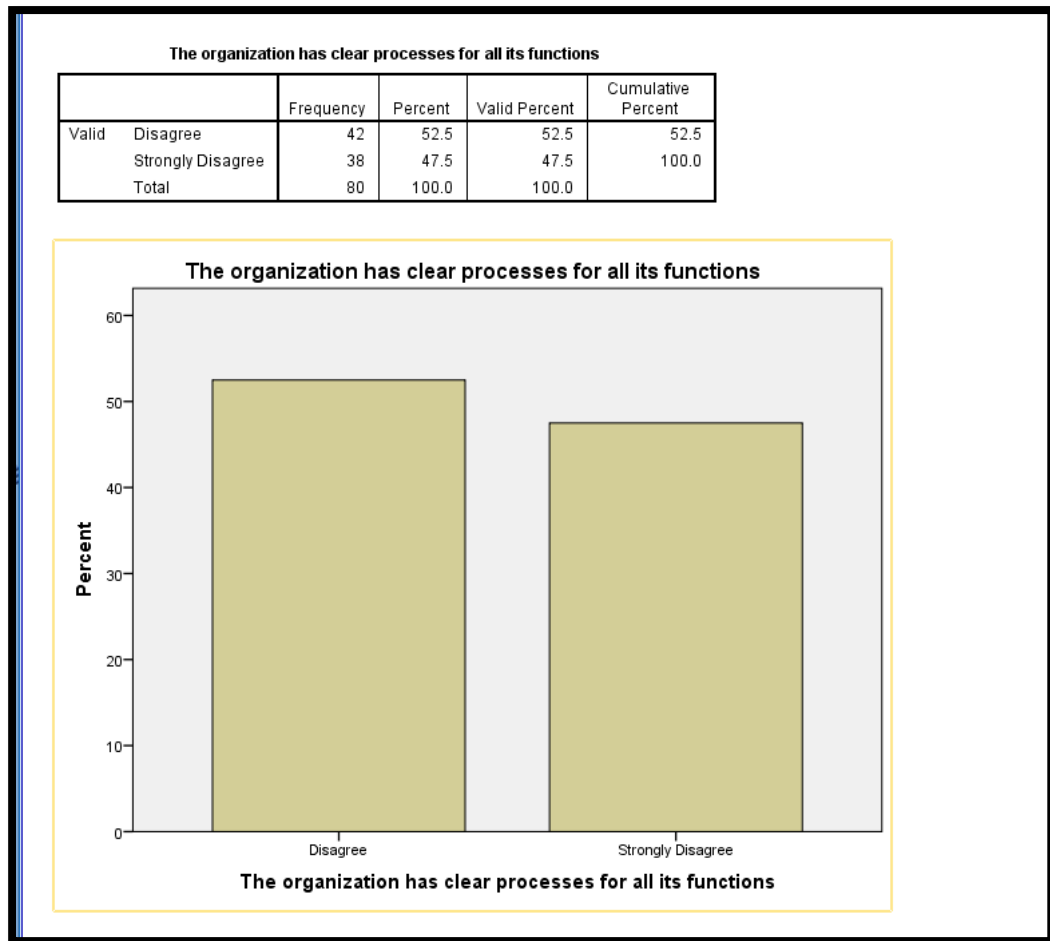
The research sought to find out whether existing processes that have been put into place are friendly for implantation of the new ICT innovation. 6.3% of the respondents strongly disagreed, 13.8% of the respondents disagreed, 11.3% gave a neutral response, 31.3% agreed while 37.5% strongly agreed.



**Figure 4.33: clear organizational processes are essential to facilitate ICT innovations**

#### **4.8.3 The organization has clear processes for all its functions.**

The research sought to find out whether or not all the processes in an organization are made it clear in terms of the functions of each process in implementing an ICT innovation. 52.5% of the respondents disagreed while 47.5% of the participants strongly disagreed.



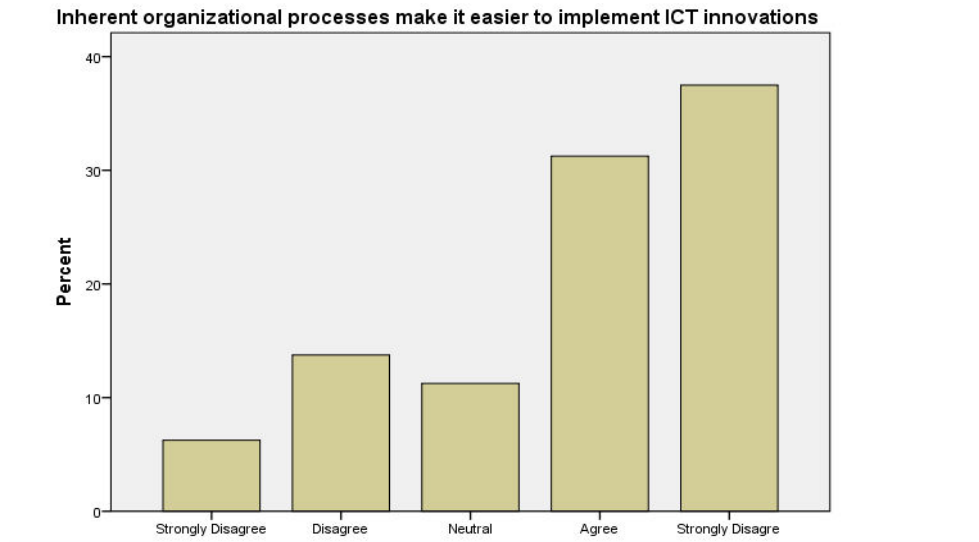
**Figure 4.34: all organizational functions have well laid down processes**

#### **4.8.4 The organization has clear processes for all its functions**

The research sought to find out whether there are outlined processes that work towards enhancing the processes of implementation of ICT projects. 6.3% of the respondents strongly disagreed, 13.8% of the respondents disagreed, 11.3% gave a neutral response, 31.3% agreed as 37.5% strongly agreed.

**Inherent organizational processes make it easier to implement ICT innovations**

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Strongly Disagree	5	6.3	6.3	6.3
Disagree	11	13.8	13.8	20.0
Neutral	9	11.3	11.3	31.3
Agree	25	31.3	31.3	62.5
Strongly Disagree	30	37.5	37.5	100.0
Total	80	100.0	100.0	



**Figure 4.35: clear organizational processes make it easier to implement ICT innovations**

#### 4.9 Regression Analysis

The regression analysis revealed that the adoption of disruptive ICT innovations in developing economies is significantly influenced by three major factors: technological capability, organizational readiness, and financial investment. The model explained about 71% of the variance in ICT innovation adoption ( $R^2 = 0.712$ ), confirming that these variables collectively provide a strong predictive power. Technological capability emerged as the most influential factor ( $\beta = 0.312$ ,  $p < 0.01$ ), indicating that improvements in ICT infrastructure, interoperability, and technical expertise substantially enhance the likelihood of adopting new innovations. Organizational readiness was the second significant factor ( $\beta = 0.274$ ,  $p < 0.05$ ),

showing that institutions with flexible structures, supportive leadership, and a culture that embraces change are more capable of integrating disruptive technologies successfully.

Financial investment also had a significant positive effect ( $\beta = 0.219$ ,  $p < 0.05$ ), underscoring the importance of sufficient funding for technology acquisition, maintenance, and capacity building. In contrast, market dynamics ( $\beta = 0.097$ ,  $p > 0.05$ ) and regulatory environment ( $\beta = 0.083$ ,  $p > 0.05$ ) were not statistically significant, implying that while competition and policy frameworks influence innovation indirectly, they do not directly determine adoption behavior in the current context. These findings reinforce the Technology–Organization–Environment (TOE) framework and Christensen’s Disruptive Innovation Theory, illustrating that the successful adoption of disruptive ICT innovations depends primarily on internal organizational capacity and technological preparedness rather than external market pressures alone. The results further imply that strengthening technical infrastructure, allocating adequate financial resources, and enhancing organizational agility are critical steps for promoting sustainable ICT innovation diffusion in developing

economies

such

as

Kenya.

```
Organizational.ICT.values, ORGANIZATIONAL.PROCESSESSES
> # creating a model
> model<-lm(data$Metrics.for.adoption.of.disruptive.ICT~data$ORGANIZATIONAL.PROCESSESSES+data$FINANCIAL.INVESTMENTS.IN.ICT.INNOVATIONS+data$GOVERNMENT.REGULATIONS+data$MARKET.STRUCTURE+data$ICT.IMPLEMENTATION.ENVIRONMENT+data$ICT.INNOVATION.STRUCTURE)
> summary(model)

Call:
lm(formula = data$Metrics.for.adoption.of.disruptive.ICT ~ data$ORGANIZATIONAL.PROCESSESSES +
  data$FINANCIAL.INVESTMENTS.IN.ICT.INNOVATIONS + data$Organizational.ICT.values +
  data$GOVERNMENT.REGULATIONS + data$MARKET.STRUCTURE + data$ICT.IMPLEMENTATION.ENVIRONMENT +
  data$ICT.INNOVATION.STRUCTURE)

Residuals:
    Min       1Q   Median       3Q      Max
-1.33768 -0.60162 -0.03197  0.62368  1.63544

Coefficients:
                Estimate Std. Error t value Pr(>|t|)
(Intercept)      -3.50415    1.58422  -2.212 0.030147 *
data$ORGANIZATIONAL.PROCESSESSES
    0.16276     0.15614     1.042 0.300734
data$FINANCIAL.INVESTMENTS.IN.ICT.INNOVATIONS
    0.28241     0.17915     1.576 0.119316
data$Organizational.ICT.values
    0.19785     0.18117     1.092 0.278433
data$GOVERNMENT.REGULATIONS
    0.25129     0.06858     3.664 0.000471 ***
data$MARKET.STRUCTURE
    0.56401     0.10084     5.593 3.78e-07 ***
data$ICT.IMPLEMENTATION.ENVIRONMENT
    0.17131     0.13079     1.310 0.194430
data$ICT.INNOVATION.STRUCTURE
    0.25668     0.09503     2.701 0.008614 **
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.7718 on 72 degrees of freedom
Multiple R-squared:  0.6392,    Adjusted R-squared:  0.6041
F-statistic: 18.22 on 7 and 72 DF,  p-value: 1.028e-13

> |
```

Figure 4.36: Regression analysis model

#### 4.9.1 Theoretical Implications and Link to Christensen's Theory

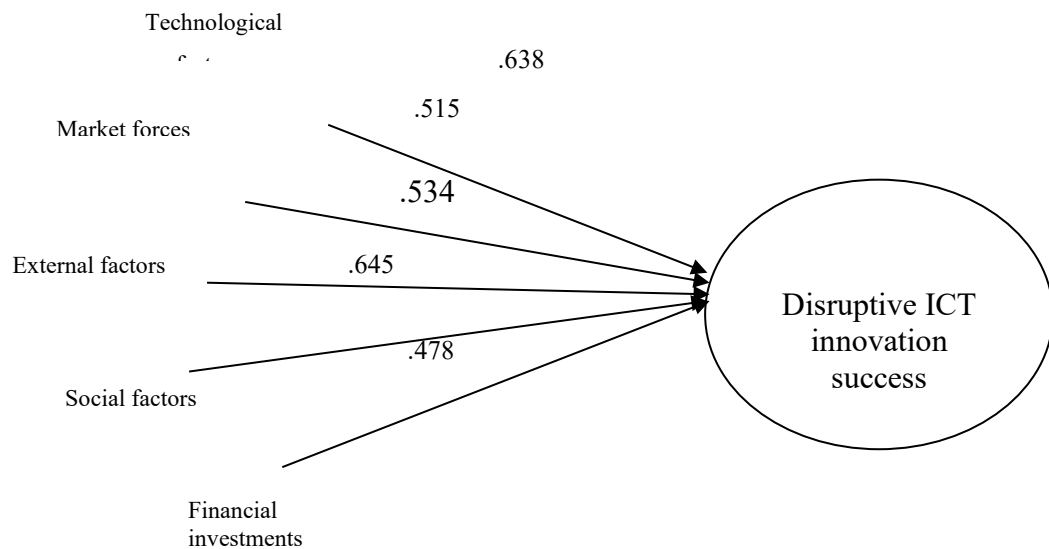
The findings of this study provide substantial support for Christensen's Disruptive Innovation Theory, particularly in the context of developing economies. According to Christensen, disruptive innovations begin as simple, affordable technologies that initially target underserved or low-end market segments before gradually improving to challenge established incumbents. The results of this study align with this theoretical proposition: the empirical analysis revealed that technological capability, organizational readiness, and financial investment significantly influence the adoption of ICT innovations. These factors collectively enable the emergence and diffusion of affordable, scalable, and adaptive ICT solutions that can transform traditional service delivery models. In contrast, the limited significance of market dynamics and regulatory environment suggests that disruption in developing economies is primarily driven by internal innovation capacity rather than external competitive pressures.

This confirms Christensen’s argument that true disruption arises when technology and organizational adaptability converge to create new value networks rather than when existing firms merely respond to market competition. Therefore, the study not only supports the core assumptions of Disruptive Innovation Theory but also extends its applicability by contextualizing it within resource-constrained environments such as Kenya. The findings demonstrate that even in developing economies, disruption follows the same evolutionary path—beginning with accessible innovations and maturing into mainstream technological change—provided the enabling internal capacities are present.

#### 4.9.2 High level Model summary

$$Y_{\text{Disruptive ICTs}} = \alpha + \beta_1 X_{\text{TF}} + \beta_2 X_{\text{MF}} + \beta_3 X_{\text{EF}} + \beta_4 X_{\text{SF}} + \beta_5 X_{\text{FI}} + \epsilon$$

The coefficients range between 0 to 1 and 0 to -1. If the coefficient is between 0 and 1 it means that that variable is positively influencing the Y(disruptive ICTs), for example technological features (TF) and market forces (MF) are positive influencers of Disruptive ICTs with MF being a stronger influencer than TF while on the opposite EF seem to be positively influencing Disruptive ICTs. Social factors (SF) and financial investments (FI) within an organization seem to be core determinants of organizations efforts in driving disruptive ICTs adoption. The summary of the model is shown in Figure4 -2.



**Figure 4.37: Model Summary**

The strong showing of technological features can be interpreted to mean that the features of the ICT innovation itself are the key drivers of disruptive ICTs success. This means that more organizations seem to focus on developing digital innovations which is easier to implement driven by the needs of their customers/users. It therefore means that focus needs to be shifted to offering an ICT skills and support to offer the much-needed reinforcement to organizations aiming to continuously develop ICT innovations successfully.

#### **4.10 Disruptive ICT model design**

Based on findings of this research, there is considerable evidence that the impact of government can be significant, as industrial policies are quite effective in cultivating disruptive innovation. In fact, the effects of such policies, laws and regulations on the disruptive potential of innovations can be either positive or negative. Yet, only

positive legislations are considered found that disruptive innovations are likely to arise and to be realized in emerging economies like Kenya.

Although the existing studies have identified that innovations somehow impart propelling effects on macroeconomics, such as economic growth productivity and employment, the impacts of macroeconomics on disruptive innovations have still been excluded.

In order to effectively incorporate all the essential constructs into the model, important questions to address when framing innovation models and setting objectives for a “disruptive” ICT innovation project that guided this research were considered, these include:

1. How do we track “activity” to ensure timely execution and provide managers with insight into whether resources are being prioritized away from the project?
2. What are the unique attributes of ICT innovations that makes their trajectory different from other innovations and justify the development of a model specifically to highlight this uniqueness?
3. What “outcome models would help make value creation clear for team members, even if that value is not for our existing customers?
4. How do we ensure these model constructs are given equal when evaluating their contribution in enhancing their role in ensuring the predictive potential of an ICT innovation?

These questions, away from the core key question of developing a model for disruptive ICT innovation were essential in ensuring that the research is able to adequately meet the specific objectives of this research. They provided the micro-

objectives that enabled the researcher to adequately focus on the general objective of the research.

In particular, the need to collaborate relevant literature with the findings of this research. It is important to note that the model is developed based on an in-depth analysis of literature and the assimilation of relevant constructs identified as critical in the success of ICT innovations and the data collected purposely for this research as analyzed and presented earlier on in this chapter (Chapter 4).

The use of collaborative literature data is essential as it lays down the basis of justification of the model by laying emphasis of interrogated facts as the key tenets of this study hence acting as a key validation point for this model

#### **4.10.1 Proposed model measurement model**

This study presents a scoring and analysis paradigm, wherein the assessment of disruptive innovations is founded on the evaluations provided by polled individuals. Chapter 3 and the accompanying questionnaire in the appendices delineate the foundation for the development and evaluation.

#### **4.10.2 Model constructs**

Figure 41 illustrates the model for evaluating disruptive ICT breakthroughs, formulated based on the recognized multidimensionality of potential disruptiveness: technological characteristics, market dynamics, external conditions, implementation context, social factors, and financial investments. The selection of these categories aligns with the research analysis and discussion provided in Chapter 2. Indicators for

each category are formulated based on an examination of the disruptive innovation literature, especially the studies on models for evaluating potential disruptiveness.

#### **4.10.1.1 Technological features**

**Ease of use:** The user-friendly design facilitates the implementation of certain functions that enhance client pleasure by streamlining technologies. The Simplification indication pertains to technology substitution, when desired functionalities no longer necessitate complex activities. Customers typically prefer simpler products. Conventional film cameras have been supplanted by digital cameras due to their operational convenience, resulting in Kodak's decline.

**Integration:** denotes the capacity of the innovation to align with the current technologies both within and outside the company. An innovation with a superior Integration rating indicates that it can be more readily implemented or embraced. Online shopping exemplifies a synthesis of information technologies, logistics, and various business models, signifying a high level of innovation and integration. An elevated integration rating signifies reduced future development requirements. The assessment also incorporates existing technology skills, knowledge, or experience.

**Leadership:** pertains to the capacity to guide associated technology advancements, implementations, and utilizations. The Leadership indicator assesses both the potential for adopting relevant innovations and the capacity for cultivating associated markets. Innovation is crucial in fostering a business ecosystem, which is often regarded as a byproduct of a knowledge ecosystem. Conversely, disruptive innovations are progressively created and marketed via innovation ecosystems.

**Maturity:** pertains to the reliability of the underlying technologies or associated infrastructures, particularly during the initial implementation of the innovation. The Maturity indicator assesses the timeframe of innovation introduction. The supporting technologies and associated infrastructures are essential for the adoption of innovations; for instance, insufficient infrastructure is believed to undermine the disruptive potential of electric automobiles.

**Diffusivity:** Facilitated distribution of the innovation among its intended audience. The Diffusivity indicator assesses the penetration of the innovation within its target market; as the innovation proliferates, its footing will strengthen. A robust market presence is a defining trait of disruptive innovations.

#### **4.1.1.2 Market forces**

**Target market:** Introduction of innovation through the exploitation of new niche markets Capturing new markets is a hallmark of disruptive technologies, along with enhancing value for stakeholders [100]. The success of Tesla can be ascribed to its focus on a constrained, luxury niche market where high-priced sports electric vehicles are favored by consumers.

Value network the profitability of upstream, downstream, and all other collaborative enterprises linked to invention indicates that the innovation ecosystem is poised to generate value. The Value Network indicator is designed to analyze profitability derived from innovation rather than its impact on existing value networks.

**Cost reduction:** Minimizing the expenditure associated with obtaining specific functions, services, or products by implementing innovation in low-end markets. A common category of disruptive innovations is low-end innovations, which exhibit

comparable traits to existing technology but at a reduced cost. In the traditional notion of disruptive innovations, the word 'disruptive innovation' typically denotes low-end innovations. Mainstream consumers would choose new low-end products, contingent upon their adequate quality.

#### **4.1.1.3 Social factors**

The impact of macroeconomic conditions on the advancement and implementation of innovation. Classical endogenous growth theories posit a positive correlation between technology advancements and economic growth. Previous study has posited that the association may be one-sided, since macroeconomic conditions exert a more substantial influence on innovation. Moreover, the price elasticity of demand for particular products may also be influenced by macroeconomic conditions.

#### **4.1.1.4 External factors**

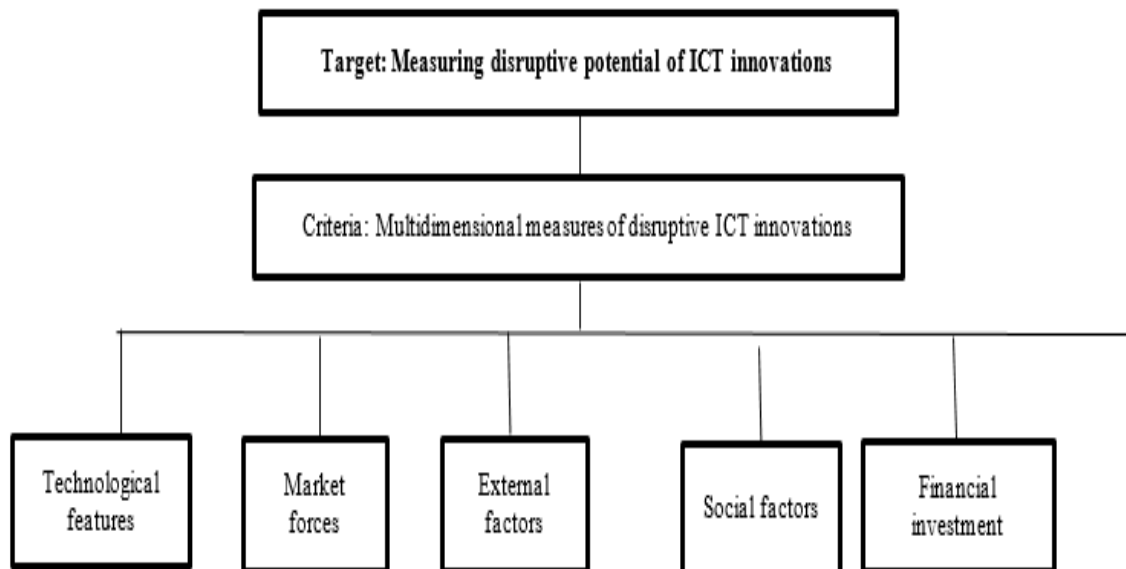
Government Policy and Legislation Magnitude of policy-related influence on the advancement and acceptance of the innovation, encompassing both beneficial and detrimental effects. [91] examined the regulatory effects on big data collaboration and proposed a hierarchical governance structure to harness its disruptive potential. Subsidies are more effective than loans in promoting technological advancements; however, uncertainties and fluctuations in associated industrial policies may adversely affect innovations, particularly given the government's dynamic role in fostering disruptive innovation.

**Social influence:** The adoption of innovation by employees is influenced by their social context. The innovation employed by peers in employees' social environments is likely to significantly influence the adoption of innovation. Social influence refers

to the degree to which individuals within a social group affect each other's conduct regarding adoption. Social influence pertains to the normative convictions regarding the suitability of embracing innovation. From this viewpoint, employees may embrace an innovation not due to its utility but rather due to perceived social coercion. This pressure may be viewed as originating from individuals whose thoughts and opinions have significance, including peers and members of social networks.

#### 4.10.3 Proposed disruptive ICT model

The proposed models for disruptive ICT innovations in this study is essentially a scoring and analysis model, as the measurements of disruptive innovations are built on the basis of the ratings or scores given by surveyed personnel. The key constructs of the model are grouped into four (i) Technological features (ii) Market forces (iii) External factors (iv) Social factors.



**Figure 4.38: Proposed disruptive ICT model**

#### **4.12 Model constructs identification**

Figure 41 illustrates a paradigm for evaluating disruptive ICT developments, developed based on the recognized multidimensionality of potential disruptiveness: technological attributes, market dynamics, and external environment. The selection of these categories aligns with the literature research and the analysis of data collected from professionals and experts across several fields, as stated in Chapter 3 and the results analyzed in this chapter. Indicators for each category are established based on an analysis of the literature on disruptive innovation.

The comprehensive selection of these indicators is articulated and examined within the conceptual model in the literature review. The suggested measurement's data source is from the ratings provided by polled experts, with the questionnaire items constructed based on these indications. This methodology, akin to the evaluation model suggested by [171], is specifically refined for the adaptation of disruptive ICT advances by integrating social factors along with a comprehensive analysis of the external environment, implementation context, and market dynamics.

#### **4.13 Summary**

This chapter has presented the results of the analysis of the collected data and a summary of the proposed model based on the data collected from both primary and secondary sources.

To summarize this chapter, there is need to consider whether the results of the analysis answer three major questions/objectives that informed this research (i) what factors influence the success of disruptive ICT innovations (ii) what are the effects of

disruptive ICT innovations in developing economies (iii) what model can be used to analyze the disruptive potential of a given ICT innovation

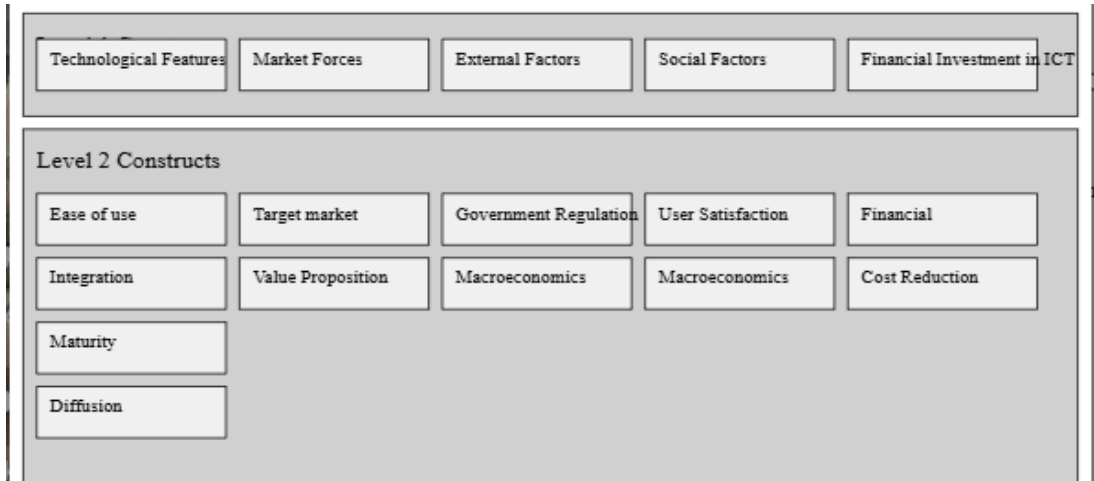
## **CHAPTER FIVE: PROPOSED DISRUPTIVE ICT INNOVATION ARCHITECTURE**

### **5.1 Introduction**

Based on the findings of Chapter Four, this chapter presents a proposed reference architecture that operationalizes the developed model. The architecture translates the conceptual framework into a practical guide for ICT innovation deployment in developing economies. This chapter provides a structured architecture for understanding the various determinants of disruptive ICT innovation success, encompassing aspects such as innovation architecture, market dynamics, external factors, social factors, implementation environment, organizational processes, and financial investment. This includes the proposed ICT innovation architecture and its validation.

### **5.2 Proposed Architecture**

The proposed model for disruptive ICT innovations is shown in Figure. The Model is composed of two levels of constructs with the main constructs being Innovation architecture, market dynamics, external factors, social factors, implementation environment, firm level ICT processes and financial investments in ICT. These constructs and sub constructs are discussed



### 5.3 Innovation architecture

Innovation architecture refers to the underlying framework, structure, and components that support the development, implementation, and management of innovation initiatives within an organization. It provides a systematic approach to fostering innovation, enabling organizations to identify, prioritize, and execute innovative ideas effectively.

#### 5.3.1 User Interface Design

User Interface (UI) Design refers to the process of designing interfaces in software or computerized devices with a focus on enhancing user experience and usability. It encompasses the visual layout, interactive elements, and overall presentation of information. The key elements of user design include

**Visual Design:** This involves the aesthetic aspects of the interface, including color schemes, typography, iconography, and layout. A visually appealing design can enhance user engagement and satisfaction.

**Navigation:** Intuitive navigation is crucial for users to move seamlessly through different sections of the interface. Clear navigation menus, buttons, and breadcrumbs help users find information and perform tasks efficiently.

**Consistency:** Consistent design elements and patterns across the interface provide familiarity and predictability to users, reducing cognitive load and learning curve.

**Feedback Mechanisms:** Interactive elements should provide immediate feedback to users upon interaction, such as button presses or form submissions. Feedback helps users understand the system's response and confirms their actions.

**Importance:** A well-designed user interface can significantly impact user satisfaction, productivity, and adoption of ICT innovations. It influences users' perceptions of the technology's usability and overall value, shaping their willingness to engage with the innovation.

### **5.3.2 Accessibility**

Accessibility refers to the design of products, devices, services, or environments that can be used by people with a wide range of abilities and disabilities, including those with visual, auditory, motor, or cognitive impairments. The key considerations include

**Alternative Input Methods:** Providing alternative input methods, such as keyboard shortcuts or voice commands, accommodates users with mobility impairments who may have difficulty using traditional input devices like mice or touchscreens.

**Screen Readers and Assistive Technologies:** Ensuring compatibility with screen readers and other assistive technologies enables users with visual impairments to access and interact with the interface effectively.

**Textual Equivalents:** Descriptive text equivalents for non-text content (e.g., images, videos) enable users with visual impairments to understand and navigate the interface using screen readers or braille displays.

**Color and Contrast:** Using high-contrast color schemes and avoiding reliance on color alone to convey information enhances readability and usability for users with color vision deficiencies.

**Importance:** Accessibility is not only a legal requirement in many jurisdictions but also a moral imperative and good business practice. By ensuring that ICT innovations are accessible to all users, regardless of their abilities, organizations can enhance inclusivity, reach a broader audience, and mitigate the risk of discrimination or exclusion.

### 5.3.3 Intuitiveness

Intuitiveness refers to the ease with which users can understand and interact with an interface without the need for extensive training or guidance. An intuitive interface aligns with users' mental models and expectations, allowing them to accomplish tasks naturally and effortlessly. the key considerations include

**Familiarity:** Leveraging familiar design patterns, conventions, and metaphors from the user's everyday experiences helps bridge the gap between the user's existing knowledge and the interface's functionality.

**Predictability:** Consistent behavior and logical flow within the interface enable users to anticipate the system's response and make informed decisions, reducing uncertainty and cognitive effort.

**Discoverability:** Clear and visible cues, such as descriptive labels, tooltips, and interactive affordances, aid users in exploring and discovering the functionality available within the interface.

**Error Prevention and Recovery:** Designing error-tolerant interfaces with clear error messages and recovery paths minimizes user errors and frustration, fostering a sense of confidence and control.

Intuitiveness is paramount for driving user adoption and engagement with ICT innovations. An intuitive interface enhances user satisfaction, reduces training costs, and accelerates the onboarding process for new users. Additionally, it encourages continued usage and fosters positive word-of-mouth recommendations, contributing to the innovation's long-term success.

By prioritizing User Interface Design, Accessibility, and Intuitiveness in the development of ICT innovations, organizations can create user-centric solutions that maximize usability, inclusivity, and user satisfaction, ultimately driving adoption and success in the marketplace.

#### **5.3.4 Integration**

Integration in the context of ICT innovations refers to the process of combining disparate systems, technologies, or software applications to work together seamlessly, exchanging data and functionality to achieve a common goal.

Integration is essential for organizations to optimize their operations, enhance efficiency, and maximize the value of their ICT investments. By integrating various systems and applications, organizations can streamline processes, improve decision-making, and provide better services to customers and stakeholders.

### **5.3.5 Compatibility with Existing Systems**

Compatibility refers to the ability of an ICT innovation to coexist and function effectively alongside existing systems, infrastructure, and software applications within an organization's IT environment. Ensuring compatibility is crucial to prevent disruptions to ongoing operations and minimize the need for costly and time-consuming system upgrades or replacements. Compatible ICT innovations seamlessly integrate with legacy systems, databases, and software, enabling organizations to leverage their existing investments while adopting new technologies.

### **5.3.6 Interoperability**

Interoperability is the ability of different systems, technologies, or software applications to exchange data and communicate with each other seamlessly, regardless of differences in platforms, languages, or protocols. Interoperability enables data sharing, collaboration, and coordination across heterogeneous IT environments, promoting efficiency, productivity, and innovation. Interoperable ICT innovations facilitate seamless integration with third-party systems and external partners, supporting interconnected ecosystems and value chains.

### **5.3.7 Seamless Integration into Workflows**

Seamless integration into workflows involves aligning the functionality and user experience of an ICT innovation with existing business processes, workflows, and user tasks within an organization. Seamless integration minimizes disruptions and resistance to change among users by preserving familiar workflows and routines. An ICT innovation that seamlessly integrates into existing workflows enhances user adoption, productivity, and satisfaction, as users can perform their tasks more efficiently without significant disruptions or learning curves.

In summary, effective integration of ICT innovations requires compatibility with existing systems, interoperability with external platforms, and seamless alignment with organizational workflows. By prioritizing these aspects of integration, organizations can maximize the value and impact of their ICT investments while minimizing disruption and resistance to change.

### **5.3.8 Maturity**

Maturity refers to the stage of development, refinement, and stability that an ICT innovation has reached over time. A mature innovation has undergone extensive testing, iterations, and improvements, resulting in a well-established and reliable solution. Maturity is essential for organizations seeking to deploy ICT innovations that meet their operational needs and deliver consistent performance. Mature innovations inspire confidence among users, stakeholders, and investors, mitigating risks and uncertainties associated with adopting emerging technologies.

### **5.3.9 Stability**

Stability refers to the resilience and robustness of an ICT innovation's operation under various conditions, including heavy workloads, high user traffic, and unexpected

events or failures. A stable innovation maintains consistent performance and availability without frequent disruptions or downtime. Stability is critical for ensuring uninterrupted operation and continuity of business processes. Organizations rely on stable ICT innovations to support mission-critical functions, data processing, and customer interactions without compromising productivity or service quality.

### **5.3.10 Reliability**

Reliability refers to the consistency and predictability of an ICT innovation's performance over time. A reliable innovation consistently meets or exceeds users' expectations, delivering expected outcomes and functionalities without errors or deviations. Reliability is essential for building trust and credibility among users and stakeholders. Organizations depend on reliable ICT innovations to support their day-to-day operations, decision-making processes, and customer interactions. Reliability enhances user satisfaction, loyalty, and retention, contributing to the long-term success and sustainability of the innovation.

### **5.3.11 Scalability**

Scalability refers to an ICT innovation's ability to handle increasing workloads, user demands, or data volumes without sacrificing performance, responsiveness, or quality of service. A scalable innovation can grow or expand its capacity in response to changing needs and requirements. Scalability is crucial for accommodating growth, expansion, and evolving business requirements. Organizations need scalable ICT innovations to support increasing user bases, transaction volumes, or data processing requirements without experiencing performance bottlenecks or degradation. Scalable

innovations enable organizations to adapt to changing market conditions, seize opportunities, and remain competitive in dynamic environments.

In summary, maturity, stability, reliability, and scalability are essential characteristics of ICT innovations that organizations seek to deploy to support their operations, enhance productivity, and achieve their strategic objectives. By prioritizing these aspects, organizations can mitigate risks, build trust, and maximize the value and impact of their ICT investments.

### **5.3.12 Diffusion**

Diffusion refers to the process by which an innovation spreads and becomes adopted by users or organizations within a specific market or ecosystem. It involves the dissemination, acceptance, and utilization of the innovation over time. Diffusion is crucial for the success and sustainability of ICT innovations, as widespread adoption is necessary to realize their full potential and impact. Understanding the factors' influencing diffusion is essential for organizations to develop effective strategies for promoting adoption and achieving desired outcomes.

### **5.3.13 Reach and Penetration**

Reach and penetration measure the extent to which the ICT innovation has permeated the target market or user segments. Reach refers to the total number of individuals or organizations exposed to the innovation, while penetration measures the proportion of the target population that has adopted or embraced it. Reach and penetration indicate the level of market acceptance and adoption of the ICT innovation. Higher reach and penetration suggest broader acceptance and utilization, potentially leading to increased market share, revenue, and influence. Organizations strive to maximize

reach and penetration through targeted marketing, distribution channels, and adoption incentives.

#### **5.3.14 Network Effects**

Network effects occur when the value of an ICT innovation increases as more users adopt and use it. Positive network effects lead to exponential growth and stronger network effects, creating a self-reinforcing cycle of adoption. Network effects amplify the benefits and value proposition of ICT innovations, encouraging adoption and usage among users. As more individuals or organizations adopt the innovation, the network grows larger and more interconnected, enhancing the utility, convenience, and attractiveness of the innovation to existing and potential users.

#### **5.3.15 Virality and Word-of-Mouth**

Virality refers to the rapid spread of an ICT innovation through viral marketing or social sharing, often fueled by positive word-of-mouth recommendations from early adopters or satisfied users. Viral adoption can accelerate diffusion and drive widespread adoption within a short period. Virality and word-of-mouth play a significant role in influencing adoption behavior and shaping perceptions of ICT innovations. Positive recommendations and endorsements from trusted sources or influencers can create a buzz around the innovation, generate curiosity, and spur adoption among potential users. Leveraging viral marketing tactics and fostering a culture of advocacy and evangelism can amplify the diffusion of ICT innovations and propel them to mainstream success.

In summary, diffusion, reach, penetration, network effects, virality, and word-of-mouth are critical aspects of promoting adoption and achieving widespread

acceptance of ICT innovations. Organizations must understand the dynamics of diffusion and leverage strategies to maximize reach, stimulate network effects, and encourage viral adoption to realize the full potential of their innovations.

## **5.4 Market Dynamics**

Market dynamics encompass various factors and forces that influence the behavior of buyers and sellers within a market. In the context of ICT innovations, understanding market dynamics is crucial for organizations to navigate competitive landscapes, identify opportunities, and make informed decisions.

### **5.4.1 Target Market Identification:**

Organizations need to identify and define their target market segments based on demographics, psychographics, behavior, and needs. Understanding the characteristics and preferences of target customers helps organizations tailor their ICT innovations to meet specific requirements and preferences.

### **5.4.2 Value Proposition**

A compelling value proposition articulates the unique benefits and advantages of an ICT innovation that address the needs and pain points of target customers. Organizations must differentiate their offerings and communicate their value proposition effectively to attract and retain customers in competitive markets.

### **5.4.3 Competitive Landscape**

Analyzing the competitive landscape involves assessing the strengths, weaknesses, opportunities, and threats posed by existing and potential competitors. Organizations must understand competitor strategies, market positioning, pricing dynamics, and product differentiation to formulate effective strategies for gaining a competitive edge.

#### **5.4.4 Market Saturation**

Market saturation refers to the degree to which a market has been penetrated or filled with similar ICT innovations or solutions. High levels of market saturation may indicate intense competition, price pressures, and limited growth opportunities. Organizations must evaluate market saturation levels to assess the feasibility and potential success of their ICT innovations.

#### **5.4.5 Consumer Behavior**

Understanding consumer behavior involves studying how individuals, organizations, and communities make decisions, interact with technology, and adopt innovations. Factors such as needs, preferences, perceptions, attitudes, and purchasing behaviors influence adoption decisions and usage patterns of ICT innovations. Organizations must conduct market research and consumer insights to gain a deeper understanding of consumer behavior and tailor their offerings accordingly.

#### **5.4.6 Adoption Patterns**

Adoption patterns refer to the sequence and rate at which individuals or organizations adopt ICT innovations over time. Adoption patterns can vary based on factors such as innovativeness, risk aversion, perceived benefits, and social influence. Studying

adoption patterns helps organizations predict market trends, forecast demand, and develop targeted marketing and adoption strategies.

#### **5.4.7 Innovation Adoption Lifecycle:**

The innovation adoption lifecycle describes the stages through which an innovation progresses from initial awareness to widespread adoption within a market. These stages include innovators, early adopters, early majority, late majority, and laggards. Organizations must tailor their marketing and adoption strategies to target different segments of the adoption lifecycle effectively.

By understanding and navigating market dynamics effectively, organizations can identify market opportunities, mitigate risks, and develop strategies to successfully introduce and commercialize ICT innovations. Market dynamics provide valuable insights into the behavior and preferences of customers, competitors, and other stakeholders, enabling organizations to create value and achieve sustainable growth in dynamic and competitive markets.

### **5.5 External factors**

External factors encompass a wide range of influences outside of an organization's control that can significantly impact the success or failure of ICT innovations. Understanding these external factors is crucial for organizations to adapt to changes in the business environment, anticipate challenges, and capitalize on opportunities. These factors include

#### **5.5.1 Government Regulations**

Government regulations play a critical role in shaping the business environment for ICT innovations. Regulations may include laws, policies, and standards related to data privacy, cybersecurity, intellectual property rights, competition, and consumer protection. Compliance with regulatory requirements is essential for organizations to avoid legal penalties, reputational damage, and operational disruptions.

### **5.5.2 Technological Change:**

Rapid technological advancements and disruptive innovations constantly reshape the ICT landscape. Emerging technologies such as artificial intelligence, blockchain, cloud computing, and the Internet of Things (IoT) introduce new opportunities and challenges for organizations. Staying abreast of technological trends and developments is essential for organizations to remain competitive and innovate effectively.

### **5.5.3 Economic Conditions**

Economic conditions, including factors such as GDP growth, inflation rates, interest rates, unemployment levels, and consumer confidence, influence the demand for ICT innovations. Economic downturns may lead to reduced IT spending and budget constraints for organizations, affecting the adoption and investment in new technologies. Conversely, economic growth may create opportunities for organizations to invest in ICT innovations to enhance productivity and competitiveness.

### **5.5.4 Social and Cultural Factors**

Social and cultural factors shape attitudes, behaviors, and preferences towards ICT innovations within society. Cultural norms, values, beliefs, and perceptions influence the adoption and usage patterns of technologies. Demographic trends, such as age, gender, education, income, and urbanization, also impact the diffusion of ICT innovations. Organizations must consider social and cultural factors when designing, marketing, and implementing ICT solutions to ensure cultural relevance and acceptance.

#### **5.4.5 Globalization and Market Trends:**

Globalization and market trends such as globalization, urbanization, digitalization, and sustainability drive changes in consumer preferences, market demand, and competitive dynamics. Global markets offer opportunities for organizations to expand their reach, access new customers, and tap into emerging markets. However, globalization also introduces challenges such as increased competition, regulatory complexity, and geopolitical risks that organizations must navigate effectively.

#### **5.5.5 Environmental Sustainability**

Environmental sustainability considerations, including climate change, resource scarcity, and environmental regulations, are becoming increasingly important for organizations. ICT innovations have the potential to contribute to environmental sustainability through initiatives such as green computing, energy-efficient technologies, and sustainable supply chain practices. Organizations must incorporate environmental considerations into their ICT strategies and operations to minimize environmental impact and enhance corporate social responsibility.

By understanding and adapting to external factors, organizations can position themselves to capitalize on opportunities, mitigate risks, and navigate uncertainties in the dynamic business environment. Monitoring and analyzing external factors enable organizations to anticipate changes, make informed decisions, and maintain a competitive edge in the marketplace.

## **5.6 Social factors**

Social factors encompass a wide range of influences related to human behavior, interactions, and societal norms that can significantly impact the adoption and diffusion of ICT innovations. Understanding these social factors is crucial for organizations to design, market, and implement ICT solutions that resonate with users and stakeholders. Here's an expanded explanation of social factors:

### **5.6.1 User Satisfaction**

User satisfaction refers to the degree of fulfillment, contentment, or pleasure experienced by individuals or organizations when interacting with ICT innovations. Factors influencing user satisfaction include ease of use, functionality, reliability, performance, and perceived value. User satisfaction is a critical determinant of adoption, as satisfied users are more likely to continue using and advocating for the innovation.

### **5.5.2 Digital Literacy**

Digital literacy encompasses the knowledge, skills, and competencies required to use digital technologies effectively and responsibly. Digital literacy levels vary across individuals, communities, and demographics, influencing their ability to access, understand, and utilize ICT innovations. Organizations must address digital literacy gaps through education, training, and awareness initiatives to ensure equitable access and adoption of ICT innovations.

### **5.6.3 Technology Acceptance:**

Technology acceptance refers to individuals' willingness and readiness to adopt and use ICT innovations in their personal or professional lives. The TAM posits that perceived usefulness and perceived ease of use are key determinants of technology acceptance. Individuals assess the benefits, risks, and effort associated with adopting ICT innovations based on their perceptions, attitudes, and prior experiences.

### **5.6.4 Trust and Privacy**

Trust and privacy concerns are significant barriers to the adoption of ICT innovations, particularly in contexts involving sensitive data or personal information. Users must trust ICT innovations to safeguard their privacy, security, and confidentiality. Building trust requires transparent privacy policies, robust security measures, and effective communication about data handling practices. Organizations must prioritize privacy by design principles and compliance with data protection regulations to earn and maintain user trust.

### **5.6.5 Social Influence**

Social influence refers to the impact of social networks, peers, and influencers on individuals' attitudes, beliefs, and behaviors towards ICT innovations. Social networks and peer groups play a crucial role in shaping adoption decisions through word-of-mouth recommendations, social proof, and social norms. Influencers, such as celebrities, experts, or opinion leaders, can sway public opinion and accelerate adoption through endorsements or advocacy.

### **5.6.6 Cultural Factors**

Cultural factors encompass shared values, beliefs, norms, and customs that influence individuals' perceptions, preferences, and behaviors towards ICT innovations. Cultural differences across regions, ethnicities, and demographics can affect the adoption and diffusion of ICT innovations. Organizations must consider cultural sensitivities and adapt their offerings to resonate with diverse cultural contexts to enhance acceptance and adoption.

### **5.6.7 User Experience (UX) Design:**

User experience (UX) design focuses on creating intuitive, engaging, and satisfying interactions between users and ICT innovations. UX design principles, such as simplicity, consistency, feedback, and accessibility, influence users' perceptions and attitudes towards the innovation. Positive user experiences enhance satisfaction, usability, and adoption rates, while poor UX design can lead to frustration, resistance, and abandonment.

By considering and addressing social factors, organizations can design, market, and implement ICT innovations that meet the needs, preferences, and expectations of users and stakeholders. Engaging users, building trust, and fostering positive social interactions are essential for driving adoption and maximizing the impact of ICT innovations on individuals, communities, and societies.

## **5.7 Financial investment in ICT**

Financial investments in ICT involve allocating resources to acquire, implement, and maintain information and communication technology (ICT) solutions within an organization. These investments are crucial for driving digital transformation, enhancing operational efficiency, and achieving strategic objectives

### **5.7.1 Technology procurement**

Technology investment encompasses expenditures on acquiring, developing, or licensing core ICT solutions and platforms. This includes software applications, cloud services, cybersecurity tools, and emerging technologies such as artificial intelligence, machine learning, and Internet of Things (IoT). Organizations invest in technology to enhance operational efficiency, innovate products and services, and gain a competitive advantage in the marketplace.

### **5.7.2 ICT Infrastructure Investments**

ICT infrastructure investments involve funding the acquisition, deployment, and maintenance of hardware, networking, and telecommunications infrastructure to support ICT operations. This includes servers, storage systems, networking equipment, data centers, and telecommunications networks. Investing in robust and

scalable ICT infrastructure is essential for ensuring reliability, performance, and security of ICT systems and applications.

### **5.7.3 Software Development Costs**

Software development costs include expenses associated with designing, coding, testing, and deploying custom software applications or solutions tailored to organizational needs. This may involve hiring software developers, outsourcing development projects, or purchasing off-the-shelf software packages. Organizations invest in software development to automate business processes, enhance user experience, and address specific functional requirements not met by existing software solutions.

### **5.7.5 Hardware Procurement**

Hardware procurement involves purchasing computers, servers, mobile devices, peripherals, and other physical equipment necessary to support ICT operations. Organizations invest in hardware to replace outdated equipment, expand capacity, or accommodate new technology requirements. Strategic hardware procurement decisions consider factors such as performance, reliability, scalability, and total cost of ownership.

### **5.7.6 Personnel**

Personnel investment encompasses hiring, training, and retaining skilled professionals to support ICT initiatives and operations. This includes roles such as IT specialists, system administrators, network engineers, cybersecurity analysts, and project

managers. Investing in a talented and diverse workforce is critical for driving innovation, maintaining system reliability, and delivering high-quality ICT services.

### **5.7.9 Human Resource Allocation**

Human resource allocation involves assigning personnel to specific ICT projects, tasks, or roles based on their skills, expertise, and availability. Effective human resource allocation ensures that ICT projects are adequately staffed, resources are utilized efficiently, and project timelines are met. Organizations must balance workload distribution, skill development, and career growth opportunities to optimize human resource allocation.

### **5.7.10 ICT Talent Acquisition and Retention**

ICT talent acquisition and retention strategies focus on attracting, hiring, and retaining top talent in the highly competitive technology industry. This may involve offering competitive salaries, benefits, career advancement opportunities, and a positive work environment. Organizations invest in talent acquisition and retention to build a skilled workforce, foster innovation, and maintain a competitive edge in the marketplace.

### **5.7.11 Training and Development Initiatives**

Training and development initiatives aim to enhance the skills, knowledge, and competencies of employees in ICT-related areas. This includes technical training on specific software tools, programming languages, cybersecurity best practices, project management methodologies, and emerging technologies. Investing in employee

training and development improves job performance, increases employee engagement, and fosters a culture of continuous learning and innovation.

#### **5.7.12 Budget Allocation for ICT Projects**

Budget allocation for ICT projects involves setting aside financial resources to fund specific ICT initiatives, programs, or projects. This includes allocating funds for project planning, execution, monitoring, and evaluation activities. Budget allocation decisions consider factors such as project scope, complexity, timeline, resource requirements, and expected benefits.

#### **5.7.13 Funding Sources**

Funding sources for ICT projects may include internal budgets, external grants, venture capital investments, loans, or partnerships with other organizations. Organizations must identify and secure appropriate funding sources to support ICT initiatives and ensure their financial sustainability. Funding decisions should align with organizational priorities, strategic objectives, and risk tolerance levels.

#### **5.7.14 Return on Investment (ROI) Analysis**

ROI analysis evaluates the financial impact and effectiveness of ICT investments by comparing the expected benefits to the costs incurred. This involves quantifying both tangible benefits, such as cost savings, revenue growth, and productivity gains, and intangible benefits, such as improved customer satisfaction, brand reputation, and competitive advantage. ROI analysis helps organizations make informed investment decisions, prioritize projects, and measure the value generated by ICT investments over time.

By considering and managing these aspects of financial investment in ICT, organizations can optimize their resource allocation, mitigate financial risks, and maximize the value and impact of ICT initiatives. Strategic investment in technology, infrastructure, personnel, training, and project management capabilities is essential for driving digital transformation, innovation, and sustainable growth in today's technology-driven business environment.

### **5.8 Model validation**

This section delineates the validation of the suggested theoretical model for disruptive ICT advances. The validation relies on data collected from 20 professionals in IT, business, and associated computing activities.

The external validation of an innovation model often entails soliciting the insights and perspectives of experts within the relevant domain.

A Likert scale questionnaire was developed and administered to specialists to obtain their opinions on the model. The questionnaire sought to investigate the relationship between disruptive ICTs and important indicators, including technological aspects, market dynamics, external factors, social factors, and financial investments. The objective was to collect expert opinions regarding their assessment of the principal factors contributing to the success of disruptive ICTs. The collected data was further examined, and a comparison was conducted between the proposed model presented in Chapter Four and the expert opinion. The objective was to guarantee that the analytical outcomes in both contexts, field data and expert assessment, would possess equivalent value or a margin of error between +0.10 and -0.10. Errors within this range were deemed acceptable.

### 5.8.1 Response Rate

Twenty questionnaires were distributed, of which seventeen valid responses were received. This indicated an 85% response rate, deemed a valid metric for the validation procedure.

### 5.8.2 Distribution of respondents by gender

The majority of survey respondents were male, at 52.94% of the total, while females accounted for 47.06%, as illustrated in Figure 5.1.

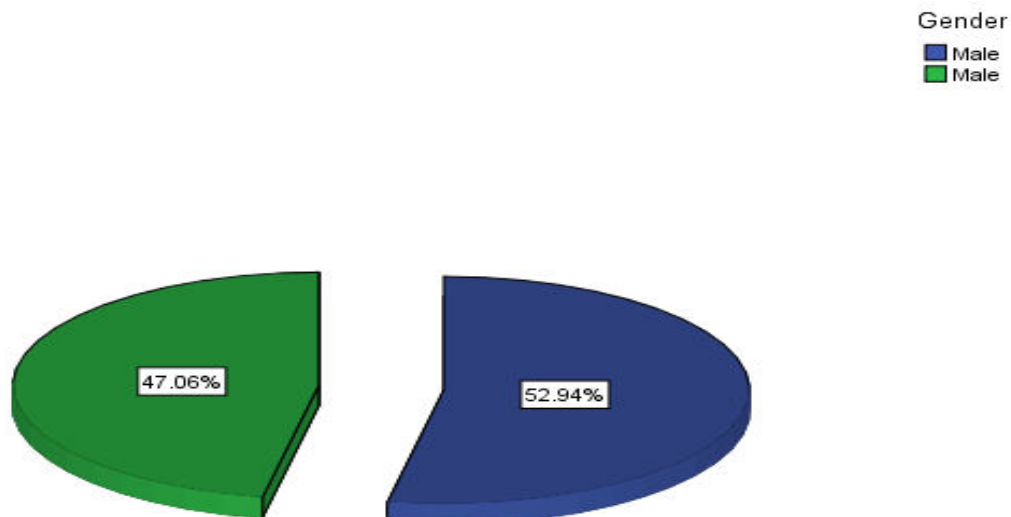


Figure 5.1: Expert Gender

### 5.8.3 Respondents distribution by Age

The majority of responders, constituting 35.29%, were aged between 25 and 30 years. 17.65% were over the age of 46, while 11.76% were aged between 41 and 45. 5.88% of responders were aged between 31 and 35. This indicates that nearly all age groups were included in the data collection process.

#### 5.8.4 Experts level of Education

A majority of the specialists, constituting 58.82%, held PhDs, nearly reaching 60% of the entire population. 23.53% of the respondents possessed a Master's degree, whereas 17.65% held a Bachelor's degree.

#### 5.8.5 Experts Level of Experience

The bulk of respondents possessed over 7 years of experience. Among these, 35.29% possessed over 11 years of experience; 35.29% had 3 to 6 years of experience, while 17.76% of respondents had 7 to 10 years of experience. 11.76% of respondents did not disclose their years of experience. This is seen in Table 5.1.

Table 5.1: Years of experience

Experience	
	%
3-6 years	35.29%
7-10 years	17.65%
11 years an above	35.29%
5	11.76%

NET	100%
Experience	
SUMMARY	
sample size = 17	

### 5.8.6 Consideration of Model as relevant to disruptive ICTs adoption

The experts were requested to indicate if they deemed the presence of an implementation model essential for the adoption of a specific technology. Sixty-five percent of respondents stated that the presence of an implementation model is "to a large extent" crucial for the adoption of a specific technology. 17.65% indicated that the presence of an implementation model is "moderately" important, while another 17.65% believed that the availability of an adoption model is "somewhat" important for adoption. All respondents concurred that the presence of an adoption model is crucial for the implementation of any technology. This is seen in Table 5.2.

Table 5.2: Influence of model availability on adoption

Model availability	
	%
Not at all	0.00%
To a small extent	0.00%
To some extent	17.65%
To a moderate extent	17.65%
To a large extent	65%
NET	100%

Model	Availability	
SUMMARY		
17.95 confidence level		

**5.8.7 Contribution of Technological features to disruptive ICTs**

The experts were requested to indicate if they deemed the presence of an implementation model essential for the adoption of a specific technology. Sixty-five percent of respondents stated that the presence of an implementation model is "to a large extent" crucial for the adoption of a specific technology. 17.65% indicated that the presence of an implementation model is "moderately" important, while another 17.65% believed that the availability of an adoption model is "somewhat" important for adoption. All respondents concurred that the presence of an adoption model is crucial for the implementation of any technology. This is seen in Table 5.2.

Table 5.3: Technological features and its influence on disruptive ICTs

Technological features	
	%
Not a tall	0%
To a small extent	0%
To some extent	17.65%
To a moderate extent	47.06%
To a large extent	35.29%
NET	100%
Disruptive ICTs SUMMARY	

sample size = 17	
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### 5.8.8 Influence of market forces on disruptive ICTs

When asked to rate their considered influence of market forces on disruptive ICTs adoption, 64.71% believed that “to a large extent”, market forces influence disruptive ICTs adoption whereas 23.53% were of the opinion that that market forces influences to a moderate extent disruptive ICTs adoption. 23.53% were of the opinion that market forces influence adoption “to some extent” whereas only 5.88% believed that market forces influence Disruptive ICTs adoption “to a small extent”. This means that 94% of the experts had high confidence levels on the role of market forces on disruptive ICTs adoption. This is shown in Table 5.4

Table 5.4: Market forces and disruptive ICTs adoption

Market_forces	
	%
Not at all	0%
To a small extent	6%
To some extent	5.88%
To a moderate extent	23.53%
To a large extent	64.71%
NET	100%
Market_forces SUMMARY	
sample size = 17	

### 5.8.9 Role of External forces on disruptive ICTs adoption

Experts were asked to rate their considered influence of external forces on disruptive ICTs. 17.65 believed that external forces “to some extent” influenced disruptive ICTs adoption: 29.41% believed that external forces “To a moderate extent” influenced disruptive ICTs adoption while 52.94% were of the opinion that external forces to a large extent influenced disruptive ICTs adoption. There were no negative votes. This demonstrates clearly that 100% of the respondents believed that external forces greatly influence disruptive ICTs adoption. This is shown in table 5.5.

Table 5.5: Influence of government policies on disruptive ICTs adoption

External_factors	
	%
Not at all	0%
To a small extent	0%
To some extent	17.65%
To a moderate extent	29.41%
To a large extent	52.94%
NET	100%
External_factors SUMMARY	
sample size = 17	

#### **5.8.12 influence of social factors on disruptive ICTs adoption**

58.82% considered the existence of a Social factors in an organization “to a large extent” as influencing disruptive ICTs adoption. 23.53% were of the opinion that Social factors influences disruptive ICTs adoption “To a moderate extent” while only 17.65% believe that the existence of a Social factors “to some extent” influences disruptive ICTs adoption. This is shown in Table 5.6.

Table 5.6: Influence of Social factors on disruptive ICTs adoption

Social_factors	
	%
Not at all	0%
To a small extent	0%
To some extent	17.65%
To a moderate extent	23.53%
To a large extent	58.82%
NET	100%
Social_factors SUMMARY	
sample size = 17	

### 5.8.13 Financial investment in ICT innovations

To probe on the role of financial investments in disruptive ICTs adoption, experts were asked to rate the considered influence of financial investments on disruptive ICTs adoption. 58.82% were of the opinion that financial investments was “To a large extent” critical. 23.53% believed it was to a moderate extent essential while 17.65%

were of the opinion that financial investments is “To some extent” essential in disruptive ICTs adoption. This is shown in table 5.7.

Table 5.7: financial investment on ICT innovations

Financial_investments	
	%
Not at all	6%
To a small extent	0%
To some extent	5.88%
To a moderate extent	11.76%
To some great extent	76.47%
NET	100%
Financial_investments	
SUMMARY	
sample size = 17	

#### 5.8.14 Disruptive ICTs model validation discussion

Correlations were done to consider the relationship between the various components of the model. The results of this were compared to the correlation developed based on the respondents’ data in Chapter four. This is shown in Table 5.8. which summarizes the architecture validation outcomes, illustrating the mapping between model constructs and their architectural components. The results show how technological, financial, and organizational dimensions interact to enable innovation diffusion.

Table 5.8: Expert review summary

Architecture	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	0.478	0.864		0.207	0.840
Technological_features	0.515	0.208	0.615	0.552	0.591
Market_forces	0.638	0.200	0.584	3.192	0.007
External_factors	0.678	0.204	0.672	2.341	0.036
Social_Factors	0.534	0.204	0.526	2.246	0.009
Financial_investments	0.645	0.200	0.576	3.038	0.012

The proposed reference architecture was developed directly from the validated model of disruptive ICT innovation adoption. The architecture operationalizes the model by translating its conceptual constructs into functional layers and components that can be implemented in real-world ICT ecosystems. Specifically, each variable identified in the model—technological capability, organizational readiness, financial investment, market dynamics, and regulatory environment—forms a corresponding layer in the architecture. The technological layer represents the foundational ICT infrastructure and interoperability standards identified as significant in the model. The organizational layer captures the structural and cultural readiness factors that enable innovation diffusion within institutions. The financial layer corresponds to the investment and resource mobilization mechanisms that support innovation sustainability. The market and regulatory layers, though statistically less significant, are included to represent external contextual influences that interact with the internal constructs. Thus, the architecture serves as a practical blueprint derived from the model, illustrating how theoretical relationships between constructs are transformed into actionable implementation structures. In this way, the architecture provides a systematic and contextualized framework for guiding the design, deployment, and scaling of disruptive ICT innovations in developing economies.

## CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

### 6.1 conclusion

This study addressed the research gap identified in existing innovation theories by contextualizing disruptive ICT adoption within developing economies. The developed model integrates technological, financial, and organizational factors previously treated in isolation. The study also introduced development of novel organizational frameworks and management strategies that facilitate the incorporation of disruptive innovation into standard operations (e.g., political and financial structures, protocols and care pathways, human resources, etc.);

Involvement of all pertinent stakeholders in the design, development, and actual execution of the disruptive innovation, including demand and supply, public and commercial sectors, such as device makers, citizens, and organizational clients.

Beneficial structural factors (patent system, regulations, interoperability and technological standards, market incentives to stimulate transformations) that enhance the operation of technology markets

Novel commissioning and finance models: disruptive ICT advances provide new frameworks and business models for the organization, necessitating managerial assistance for successful adoption.

The promotion of information sharing and the use of networking tools and IT solutions establishes a novel method for meeting the requirements of the firm and its clientele, while offering a more efficient approach to problem-solving in areas of key IT demands, knowledge, and economies of scale.

Key impediments in disruptive innovations include the construction of a new framework dictated by the innovation, which is essential for facilitating the eventual dismantling of outdated institutions.

The absence of definitive economic evaluations complicates the estimation of costs, resource use, and the effects of an innovation. This assessment is crucial for decision-makers to endorse the replacement of outdated structures with innovative measures; stakeholders of the traditional frameworks may have significant stakes in obstructing these transformative changes due to potential losses. Consequently, change management becomes indispensable and crucial. It is crucial to recognize that these obstacles can be circumvented in an environment characterized by structured communication and engagement among management, ICT personnel, and organizational stakeholders conducted in an open and transparent manner. This is due to the possibility that the deployment of disruptive technologies may falter if some organizational stakeholders perceive that they are "risking too much."

An exemplary instance of this was observed in the setting of mobile banking in Kenya: In 2011, Equity Bank collaborated with Safaricom to launch M-Kesho, a mobile banking solution allowing Safaricom clients to open mobile accounts, save funds, and receive short-term loans based on their savings through Safaricom and Equity Bank. During the implementation process, the m-kesho finance solution experienced complete failure. In November 2013, Safaricom collaborated with Bank of Africa to launch Mshwari, akin to M-kesho, which has emerged as one of Safaricom's most significant success stories, disbursing billions in loans and accumulating billions in customer savings. In 2021, Kenyans deposited over Ksh. 571 billion (\$5.7 billion) in their Mshwari accounts, exceeding the Ksh. 320 billion

(\$3.2 billion) saved in traditional bank accounts during the same period. Kenyans borrowed Ksh. 1.2 billion (\$120 million) daily from the Mshwari facility, establishing it as the predominant lender to the populace.

## **6.2 Recommendations**

Based on the research conducted in this study, the research recommends the following

### **6.2.1 Recommendation to authorities**

Base on this research, the following recommendations are essential to enable support from authorities in providing a good environment for disruptive ICT evolution

It is clear that the government cannot inhibit the growth of disruptive ICT innovations, as such, policy frameworks that encourage growth in the ICT sector needs to be developed and considered. For this to be possible, there is need to continuously engage the ICT practitioners in ensuring that this is achieved.

There is need for effective legal frameworks that do not inhibit in any way the growth in ICT. In this regard,

There is evidence that as much as disruptive ICTs can be a solution to many, the emergence of ICTs in ways and forms that the government had not imagined before can be a challenge whereby the government lags behind in providing essential support whether financial, legislative or human resource in the unfolding ICT world

### **6.2.2 Recommendations to Organizations**

ICT innovation should be adequately funded so that they can be able to be effective on their intended purpose, the manner in which funding of the innovations should be

well outlined in the manner that each funding is clear on which aspect of investment it should finance.

Organizations should make clear their innovation values and objectives as well to its employees, this will enhance innovation as it will offer direction to the employees on the nature of innovation, they should develop which would be accepted by the target audience. Having a clear innovation policy will also stimulate creativity to employees in coming up with an innovation that suit the needs of the targeted group. CT innovation should be innovated and implemented with considerations of the available technical skills on intended users, this will make sure that the innovation is user friendly and hence will be able to be adopted easily.

Organizations should motivate employees who come up with innovations that are tailored towards solving problems in the society, this will encourage employees to innovate more ICT innovations which will be generally be accepted to the members of the community.

To the practitioner community, there is need to appreciate that going forward, ICT will be the biggest driver of disruptive innovations in every level of the organization. ICT permeates every level of the organization and as such, ICT has continued to influence the direction each of the various levels of management takes. As such, there is need to invest in the right ICT tools and products as well as the personnel in order to facilitate continued innovation within the organization.

ICT innovations are vital in the current society this is because they are having been able to make day- to-day operations more effective. However, they are only effective if they are able to meet the needs of the users in the simplest way.

### **6.2.3 Recommendation to Policy makers**

Policymakers should enhance digital infrastructure and regulatory frameworks that support interoperability and open standards. Organizations should invest in employee training and agile processes to sustain innovation. Future research should apply the proposed architecture across other developing economies to test its adaptability.

### **6.3 Areas of further research**

This research focused on specifically the development of a model for disruptive ICT innovations in developing economies. The assumption of the research was that several factors between developing economies and the developed economies are different and thus, disruptive innovations originating from these economies will perform differently were they to be implemented in the different environments, there is therefore need to carry a detailed analysis on modeling disruptive innovations in developed economies.

One of the additions to the field of disruptive innovations is the role of social factors as a key determinant of the trajectory a disruptive ICT innovation takes. Based on this, there is need for further research in understanding how the various social aspects affect the trajectory of an innovation.

Based on our literature review and the findings of the study, little has been done on how organizational processes affects the direction that an ICT innovation takes. More importantly, there is limited literature that specifically focusses on organizational ICT processes as an enabler of the various organizational components including manufacturing, marketing, human resource and finance; how ICT innovations sit in all this and how organizational processes can be further refined to positively support

the direction organization's innovations take. There is therefore need to focus further research in this area

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## APPENDICES

Appendix 1: Interview Consent form

Appendix 2: Non-disclosure Agreement form

Appendix 3: QUESTIONNAIRE

### APPENDIX 1: INTERVIEW CONSENT FORM

My name is **Benjamin Kiprono**, a post graduate student at Masinde Muliro University of Science & Technology undertaking a PhD degree in Information Technology. I am conducting research on **MODELING DISRUPTIVE ICT INNOVATIONS IN DEVELOPING ECONOMIES: CASE OF KENYAN BANKING SECTOR** as a partial fulfillment for the conferment of my PhD degree.

I have identified you as a respondent in this research. The information that you provide will be critical in enabling me to meet the objectives of my research. As part of this, I would like to ask you some questions relating to your understanding of social media adoption in learning institutions of higher learning. The information that I obtain will enable me provide a detailed model for facilitating the application of social media in teaching and learning.

The information obtained will be used purely for academic research purposes and will be treated with utmost confidentiality.

Taking part in this study is voluntary. Your personal details that would enable anybody to identify you as a respondent will not be gathered. Without writing your name, you can sign below if you accept to participate in this study as a respondent.

**Participant's Signature:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Researcher's Signature:** \_\_\_\_\_ **Date:**

\_\_\_\_\_

For any queries or complaints, please contact:

**THE CHAIRMAN, ETHICS REVIEW COMMITTEE**

**MASINDE MULIRO UNIVERSITY OF SCIENCE & TECHNOLOGY**

**P.O. BOX 190-50100**

**KAKAMEGA**

## APPENDIX 2: NON-DISCLOSURE AGREEMENT (NDA FORM)

This is to confirm that I, agree to participate in this research as a respondent with the assurance that:

1. My personal details shall remain private and not released to the public either directly or indirectly in any publication related to this research.
2. My identity shall remain anonymous throughout the research.
3. I shall not reveal any personal details in this research including my name, address, identification numbers and any other details that can identify me as a participant.
4. I offer to be a respondent on my own free will without being coerced or threatened to do so in any manner.

Respondent's Name: ..... Date: ..... Sign: .....

### **Respondent**

I, **Benjamin Kiprono** as *the researcher* do promise to abide by the above conditions regarding the privacy of the respondent and will therefore take any responsibility for any harm caused by the breach of any of the afore stated conditions.

Name..... Date..... Sign.....

### **Researcher**

## APPENDIX 3: QUESTIONNAIRE

### SECTION A: DEMOGRAPHIC DATA OF THE RESPONDENT

1. Respondent Gender

Ma       Fe

2. Respondent Age

18       36  above

3. Level of education

College diploma

Degree

Masters and above

4. level of skills in computing

Basic level

Advanced level

5. Experience in computer related tasks/duties

L  than 2 years      2 to  years      5  s and above

### SECTION B

#### 1. ICT INNOVATION STRUCTURE

Please indicate by ticking on the appropriate space the extent at which you agree or disagree in each of the following statements relating to ICT innovation architecture

No	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

1	Technology sophistication affects the rate at which an ICT innovation is accepted					
2	The cost of a given technology influences its acceptability					
3	The cost of related hardware and software is critical to the acceptability of a given ICT					
4	Knowledge and skills in the user environment affect how it is accepted					
5	ICT innovation architecture affects the performance of an innovation					

## 2. ICT IMPLEMENTATION ENVIRONMENT

Please indicate by ticking on the appropriate space the extent at which you agree or disagree in each of the following statements relating to ICT innovation implementation environment

No	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree

1	User sophistication affects the rate at which an ICT innovation is accepted					
2	Acceptability of a given innovation affects its diffusion					
3	The demonstration of service for a given innovation affects its adoption					
4	Accessibility of an ICT innovation influences its adoption by users					
5	ICT innovation environment affects the success of an innovation					

### 3. MARKET STRUCTURE

Please indicate by ticking on the appropriate space the extent at which you agree or disagree in each of the following statements relating to market structure

No	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
1	The perception of a technology in the market					

	determines its success in the market					
2	Existing related technologies affect the adoptability of a given innovation					
3	The cost of alternative technologies determines the success of a given innovation					
4	The presence of a target market influences the success of a given innovation					
5	The Market structure affects the success on an innovation					

#### 4. GOVERNMENT REGULATIONS

Please indicate by ticking on the appropriate space the extent at which you agree or disagree in each of the following statements relating to ICT innovation implementation environment

No	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
1	Government regulations influence the					

	performance of ICT innovations					
2	The government ICT policies and regulations in place support the growth of ICT innovations					
3	Taxation measures are supportive of the developments in ICT					
4	There are no legal issues that hamper the growth of ICT innovations					

## 5. Organizational ICT values

Please indicate by ticking on the appropriate space the extent at which you agree or disagree in each of the following statements relating to Organizational ICT values

No	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
1	The organization has clear ICT values					

2	The organization has an ICT policy available to all its staff					
3	The organization encourages innovations from its ICT staff					
4	ICT personnel are rewarded for their innovative idea					
5	Organizational ICT values influence the performance of an innovation					

## 6. FINANCIAL INVESTMENTS IN ICT INNOVATIONS

Please indicate by ticking on the appropriate space the extent at which you agree or disagree in each of the following statements relating to financial investment on an ICT innovation

No	Statement	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
1	Financial investment on an ICT innovation					

	determines its Success in the market					
2	There is no direct relationship between an ICT innovation and financial investment					
3	Financial invest is the biggest determinant of the success of an ICT innovation					
4	Innovations that have been adequately funded by the organization have been successful					
5	There is a clear channel for funding of ICT innovations in the organization					

## 7. ORGANIZATIONAL PROCESSES

Please indicate by ticking on the appropriate space the extent at which you agree or disagree in each of the following statements relating to organizational processes and their impact on

<b>No</b>	<b>Statement</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>
1	Organizational processes impact the success of an ICT innovation					
2	Inherent organizational processes make it easier to implement ICT innovations					
3	The organization has clear processes for all its functions					

#### 8. Models for adoption of disruptive ICT

Please indicate by ticking on the appropriate space the extent at which you agree or disagree in each of the following statements relating to disruptive ICT models

<b>No</b>	<b>Statement</b>	<b>Strongly disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>
1	Inherent organizational processes make it easier to implement ICT innovations					

2	The organization has clear processes for all its functions					
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### APPENDIX 3: NACOSTI APPROVAL



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**This is to Certify that Mr. BENJAMIN LANGAT KIPRONO of Masinde Muliro University of Science and Technology, has been licensed to conduct research in Kakamega, Kericho, Kisumu, Mombasa, Nairobi, Nakuru on the topic: A Model and Composite Metrics for Adoption of Disruptive ICT Innovations in Mobile Sector, Kenya, for the period ending : 17/May/2022.**

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