

Resilience in Emerging Digital Economies: Case Study of Kenya During COVID-19 Pandemic



William Baraza, Jonathan Peter Mwakijele, Geoffrey Gitau Kamau, Atsushi Yamanaka, Lawrence Dinga, John Mpapalika, and Stephen Gachogu

Resilience in Emerging Digital Economies: Case Study of Kenya During COVID-19 Pandemic

November 2022

William Baraza, African Advanced Level Telecommunications Institute (AFRALTI)

Jonathan Peter Mwakijele, AFRALTI

Geoffrey Gitau Kamau, Zetech University

Atsushi Yamanaka, Kobe Institute of Computing

Lawrence Dinga, AFRALTI

John Mpapalika, AFRALTI

Stephen Gachogu, AFRALTI

Acknowledgments

This report was authored by William Baraza, Jonathan Peter Mwakijele, Geoffrey Gitau Kamau, Atsushi Yamanaka, Lawrence Dinga, John Mpapalika and Stephen Gachogu on behalf of African Advanced Level Telecommunications Institute. In producing the report, African Advanced Level Telecommunications Institute has used funds from a grant provided by ITU under Connect2Recover initiative.

Please consider the environment before printing this report.

© African Advanced Level Telecommunications Institute, 2022

Some rights reserved. This work is licensed to the public through a Creative Commons Attribution-NonCommercial-Share Alike 3.0 IGO license (CC BY-NC-SA 3.0 IGO).

Under the terms of this licence, you may copy, redistribute and adapt the work for non-commercial purposes, provided the work is appropriately cited. In any use of this work, there should be no suggestion that African Advanced Level Telecommunications Institute endorse any specific organization, products or services. The unauthorized use of African Advanced Level Telecommunications Institute names or logos is not permitted. If you adapt the work, then you must license your work under the same or equivalent Creative Commons licence. If you create a translation of this work, you should add the following disclaimer along with the suggested citation: "This translation was not created by African Advanced Level Telecommunications Institute. African Advanced Level Telecommunications Institute is not responsible for the content or accuracy of this translation. The original English edition shall be the binding and authentic edition". For more information, please visit <https://creativecommons.org/licenses/by-nc-sa/3.0/igo/>

Disclaimers

This is a publication that has been produced by African Advanced Level Telecommunications Institute. ITU is not involved in the preparation, drafting, editing, or finalization of this publication, and consequently, it is not responsible for its content or of the content of its external sources and does not warrant the accuracy, reliability or timeliness of any information contained therein.

The views, opinions, findings and conclusions expressed in this publication are those of the authors and do not necessarily reflect the views of African Advanced Level Telecommunications Institute, ITU or ITU's membership.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of ITU or ITU's membership concerning the legal status of any country, territory, city, or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the authors, African Advanced Level Telecommunications Institute, or ITU in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

All reasonable precautions have been taken by African Advanced Level Telecommunications Institute to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader.

Third-party materials

If you wish to reuse material from this work that is attributed to a third party, such as tables, figures or images, it is your responsibility to determine whether permission is needed for that reuse and to obtain permission from the copyright holder. The risk of claims resulting from infringement of any third-party-owned component in the work rests solely with the user.

Cover photo credits: Shutterstock

Table of Contents

LIST OF TABLES	V
LIST OF FIGURES	VI
LIST OF ABBREVIATIONS	VII
GLOSSARY OF TERMS	VIII
EXECUTIVE SUMMARY	IX
1. INTRODUCTION	1
1.1 BACKGROUND	1
1.2 DIGITAL ECONOMY	3
1.3 KENYA AS AN EMERGING DIGITAL ECONOMY	4
1.4 IMPACTS OF COVID-19 ON THE DIGITAL ECONOMY.....	4
1.5 MARKET RESILIENCE IN KENYA’S DIGITAL ECONOMY DURING COVID-19	5
1.6 KENYA’S RESPONSE TO THE COVID-19	6
1.7 SCOPE OF THE STUDY.....	8
1.8 AIM OF THE RESEARCH	8
1.9 SPECIFIC OBJECTIVES	8
1.10 RESEARCH QUESTIONS	8
2. LITERATURE REVIEW.....	9
2.1 INTRODUCTION.....	9
2.2 MARKET RESILIENCE.....	9
2.3 NETP GUIDELINES ON MARKET RESILIENCE	9
2.4 SMART MATURE RESILIENCE (SMR) FRAMEWORK MODEL.....	10
2.5 THEORY OF CHANGE	11
3. APPROACH AND METHODOLOGY	12
3.1 INTRODUCTION	12
3.2 RESEARCH APPROACH AND METHODOLOGY	13
3.3 DATA COLLECTION METHODS	13
3.4 DATA ANALYSIS MODEL.....	14
4. DATA ANALYSIS AND FINDINGS	14
4.1 MARKET RESILIENCE STATUS IN KENYA DURING THE COVID-19 PHENOMENON	14
4.2 MARKET CHANGES EXPERIENCED IN KENYA DURING THE COVID-19 PANDEMIC	21
4.3 OVERVIEW ON THE PERFORMANCE OF THE KENYA’S ECONOMY	21
4.4 PERFORMANCE OF KENYA’S TELECOMMUNICATIONS SECTOR.....	22
4.4.1 Mobile and Fixed Line Subscriptions.....	24
4.4.2 On- Net and Off-Net Mobile Voice Traffic.....	25
4.4.3 International Incoming and Outgoing Mobile Voice Traffic	26
4.4.4 Roaming Out and Roaming In Voice Traffic in Minutes Growth	26
4.4.5 Total Local Fixed Network Traffic and Fixed VoIP Traffic Growth	27
4.4.6 On-Net and Off-Net Mobile SMS Traffic.....	28
4.4.7 International incoming and international outgoing mobile SMS traffic.....	28
4.4.8 Mobile Money Services	29
4.4.9 Data/Internet Services	30
4.4.10 Broadcasting services.....	31
4.4.11 Postal and Courier Services	32
4.4.12 Cyber security.....	33
4.5 INTERVENTIONS THAT WERE TAKEN FOR MARKET RESILIENCE IN KENYA	33
4.6 EFFECTS OF MARKET RESILIENCE RESPONSES UNDERTAKEN IN KENYA	38
5. DISCUSSIONS.....	41
6. CONCLUSIONS AND RECOMMENDATIONS.....	42

List of Tables

Table 1: Text map of Market Resilience Status of Kenya During the COVID-19 Pandemic 15
Table 2: Telecommunications Statistics 2018-2021 22
Table 3: Thematic areas of Interventions taken by Kenya in response to COVID-19 34
Table 4: Interventions by the Government of Kenya that Respondents found effective 39

List of Figures

Figure 1: Stages of Resilience Maturity (SMR, 2018	11
Figure 3: Graphical analysis of question L1	16
Figure 4: Graphical analysis question L2	16
Figure 5: Graphical analysis of question L3	17
Figure 6: Graphical analysis of question L4	17
Figure 7: Graphical analysis of question I1	18
Figure 8: Graphical analysis of question I2	18
Figure 9: Graphical analysis of question P1	19
Figure 10: Graphical analysis of question P2	19
Figure 11: Graphical analysis of question C1	20
Figure 12: Graphical analysis of question C2	20
Figure 13: Kenya's economic performance (GDP Annual Growth, Source: IMF, 2022)	21
Figure 14: Mobile subscriptions	24
Figure 15: On-Net and Off-Net Mobile Voice Traffic	25
Figure 16: International Incoming and Outgoing Mobile Voice Traffic	26
Figure 17: Roaming Out and Roaming In Mobile Voice Traffic	26
Figure 18: Total Local Fixed Network Traffic and Fixed VoIP Traffic	27
Figure 19: On-Net and Off-Net Mobile SMS Traffic	28
Figure 20: International incoming and international outgoing mobile SMS traffic	28
Figure 21: Mobile Money Services	29
Figure 22: Data/Internet Services	30
Figure 23: Broadcasting services	31
Figure 24: Postal and Courier Services	32
Figure 25: Data/Internet and broadband subscriptions	33

List of Abbreviations

COVID-19	Coronavirus Disease Of 2019
Gbit/s	Gigabits Per Second
GDP	Gross Domestic Product
GSM	Global System for Mobile
HAP	High-Altitude Platform
HAPS	High-Altitude Platform Station
HHI	Herfindahl-Hirschman Index
HSPA	High Speed Packet Access
HSPA+	High Speed Packet Access Plus
HTTP	Hypertext Transfer Protocol
ICT	Information and Communication Technology
IEEE	Institute of Electrical and Electronics Engineers
IoT	Internet of Things
IP	Internet Protocol
ISP	Internet Service Provider
IT	Information Technology
ITU	International Telecommunications Union
LDC	Least Developed Countries
LIPC	L eadership & Governance; I nfrastructure and Resources; P reparedness; And C ooperation
MNO	Mobile Network Operators
NETP	National Emergency Telecommunications Plan
OECD	Organisation For Economic Co-Operation and Development
PtMP	Point-to-Multipoint
PtP	Point-to-Point
QoS	Quality Of Service
SDG	Sustainable Development Goal
SIM	Subscriber Identity Module
SMART	S tarting; M oderate; A dvanced; R obust and Vertebrate
SMB	Small or Medium-Sized Business
SME	Small or Medium-Sized Enterprise
SNMP	Simple Network Management Protocol
STEM	Science, Technology, Engineering, and Mathematics
TCP	Transmission Control Protocol
TIES	Telecommunication Information Exchange Service
TLS	Transport Layer Security
TVWS	Television White Space
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children’s Fund
WCDMA	Wideband Code Division Multiple Access
WDI	World Development Indicators

Glossary of Terms

Digital Economy	The entirety of sectors that operate using digitally-enabled communications and networks leveraging Internet, mobile and other technologies.
Market resilience	The capacity of a market to tolerate major external shocks, while maintaining core attributes and continuing to learn, adapt and develop responses to change.
Market resilience maturity	A framework that uses qualitative indicators to capture and rate the maturity of a market
Open Source	Denoting software for which the original source code is made freely available and may be redistributed and modified.
Resilience	resilience is the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth.
Universal Digital Connectivity	Anyone, anywhere, regardless of geographic location, socio-economic status, race, gender, or any other differentiating demographic, has access to affordable services and devices to connect to reliable and safe Internet.

EXECUTIVE SUMMARY

This research report has been prepared for the International Telecommunication Union (ITU) by the project team of African Advanced Level Telecommunications Institute (AFRALTI), Kenya in collaboration with Kobe Institute of Computing, Japan. The study aimed to assess market resilience in emerging digital economies with a case study of Kenya during the COVID-19 pandemic in line with ITU's Connect2Recover Research Competition 2021/2022 whose goal is to improve research focus on rebuilding developing economies better through affordable and reliable broadband connectivity. Thematic areas explored for market resilience focused specifically on various aspects of emergency communications and performance statistics based on reports from the Communications Authority (2018-2021). It also evaluated the market resilience baseline of when COVID-19 struck, the responses undertaken and their effects on market resilience after the pandemic. A LPIC-SMART evaluation model was used to review the market resilience from the perspectives of **L**eadership & Governance; **I**nfrastructure and Resources; **P**reparedness; and **C**ooperation (LIPC). Questionnaire items were used to score the market resilience levels as **S**tarting; **M**oderate; **A**dvanced; **R**obust and **V**erTebrate (SMART).

The COVID-19 pandemic and its control measures were found to have increased human dependency on digital infrastructures. The COVID-19 crisis underscored the critical role of digital connectivity and digital services in supporting social and economic resilience in the face of pandemics. The Internet and other digital infrastructures enabled business continuity and people could remotely work, attend classes, medical aid and emergency responses, order food and supplies, and connect with family and friends. The Government also relied on digital connectivity to deliver critical public services and enforcement of COVID-19 measures of tracking, tracing, testing and treating. This study has demonstrated that the COVID-19 crisis made the market resilience of Kenya to improve from Moderate to Advanced, although it still needs to attain the level of being Robust or Vertebrate. It is also recommended that the newly instituted COVID-19 pandemics guidelines and policies should be analysed for consideration as permanent guidelines and policies in the post COVID-19 pandemic society and to prepare for future pandemics. This task should not only be implemented in Kenya alone, but it should be performed at both regional and global levels. The Regional and global frameworks could be spearheaded by regional organisations such as the East African Community (EAC) and African Union for Africa, and the UN or similar international coordination body for the global context.

Key Words: market resilience, digital economies, COVID-19 and pandemic

1. INTRODUCTION

1.1 Background

Global pandemics happen every once in a while. Since the Spanish influenza pandemic about a century ago, after the second world war, the world had not experienced another pandemic at the scale witnessed when COVID-19 struck. The threat to human existence by COVID-19 was present leading to various global crisis response initiatives, including those led by the United Nations (UN). The International Telecommunication Union (ITU), the UN agency responsible for global coordination of Information and Communication Technologies (ICTs) and telecommunications policies and standards initiated the

Connect2Recover initiative, whose objective was to expand access to affordable and reliable broadband connectivity in developing countries as they adjusted in the wake of COVID-19 pandemic (ITU,2020). Connect2Recover aimed at to reinforce the digital infrastructure and digital ecosystems of beneficiary countries, and to provide means of utilizing digital technologies such as teleworking, e-commerce, remote learning and telemedicine to support the COVID-19 recovery efforts and preparedness for the 'new normal' (and potential future pandemics). Further, it sought to galvanize action for affordable and reliable connectivity as part of COVID-19 recovery strategies, as countries prepare for and adjust to the new circumstances caused by the pandemic and ultimately achieve continuity of ITU's core work and mission, which is to extend connectivity to everyone. In this regard, Connect2Recover also organized an international Research Competition.

The Research Competition was intended to identify promising research proposals that would accelerate digital inclusion during the COVID-19 recovery globally. As a first of its kind, among others, it aimed to improve research focus, build a global research community, and promote knowledge sharing in the area of digital resiliency and digital inclusion, in line with the objectives of Connect2Recover. A study on market resilience during COVID-19 with a focus on Kenya was one of the proposals that were selected by ITU's Connect2Recover Research Competition.

Market resilience ensures a dynamic Digital Economy by stimulating competition and innovation (World Bank, 2019; UNCTAD, 2019, ICTA, 2019). Market resilience has been presented as a part of the country-level Internet resilience framework by Connect2Recover (ITU, 2021). Connect2Recover's country-level resilience framework is also based on the work done by Afrinic/ISOC project: MIRA (Afrinic-ISOC, 2021). The country-level Internet resilience framework identified Internet Service Provider (ISP) resilience, Critical Infrastructure resilience and Market Resilience as the three specific categories of threats and obstacles (both internal and external) that impact Internet infrastructure, and the mechanisms for increasing the overall resilience of Internet services. In the broader sense, Country-level Internet Resilience encompasses the ability of a country's national Internet ecosystem (ISPs, physical infrastructure, market structure) to provide Internet services to its citizens at an acceptable level of service in the face of faults and challenges to normal operations. The first component of the framework, which is Critical Infrastructure Resilience focuses on the resilience of the power infrastructure, the Internet cable infrastructure (both terrestrial and undersea), as well as the country-code Top-Level Domain (ccTLD) infrastructure. The second component of the framework, Network/ISP Resilience will dwell on the ability of a network to continue providing an acceptable level of service as well as secure and resilient services in the event of an

outage or during a crisis including relating to cybersecurity. This study was specific to Market Resilience (third component in the framework), which is the ability of the market to self-regulate and provide affordable prices to end-users by maintaining a diverse and competitive market (ITU, 2021; Garnett, 2021). Market resilience includes competitiveness and market concentration (which is often measured using Herfindahl-Hirschman Index (HHI)), and on affordability of services.

The COVID-19 pandemic and its control measures have exacerbated the human dependency on digital infrastructures resulting in an unprecedented spike in broadband traffic. The COVID-19 crisis underscores the critical nature of digital connectivity and digital services in supporting socio-economic resilience in the face of the pandemic. The social distancing and pandemic-triggered lockdown have made it clear that the reliability and resilience of digital infrastructure, as well as the availability and affordability of connectivity are necessary to maintaining social interactions and enabling the continuity of services (World Bank, 2020). Individuals have been able to work, attend classes, receive medical advice, order food and goods, and connect with family and friends remotely via the Internet. Moreover, Governments have relied on digital connectivity to deliver critical public services such as health alerts as well as supporting the enforcement of COVID-19 mitigation measures via contact tracing. Many markets are seeing increased use of digital infrastructure and services compared to the pre-COVID-19.

The COVID-19 market shocks have been evident in all critical digital infrastructure, not to mention problems of choke points and affordability. Globally it is estimated that during 2020, digital transformation accelerated and advanced by up to seven years (Check Point Research, 2021). This sparked increased Internet traffic by up to 60% shortly after the outbreak (OECD, 2020). The critical aspects of this phenomenon are that broadband connectivity spikes were attributable to continuing daily and business activities, such as buying groceries and food delivery services, B2B e-commerce, and telecommuting services, for instance video conferencing that are permeating education and business communication, and telemedicine for medical consultations and services (EAP-CSF, 2020). In spite of all these, the digital divide has been highlighted as a serious barrier to the mitigation potentials of digitization. In particular, the population that is unserved or under-served by broadband cannot benefit from online learning services, such as for children, telecommuting services, and access to e-commerce and healthcare information (ITU, 2020). Persistent skills gap in digital literacy, service affordability, universal access, consumer protection, and return on investment for service providers are still issues calling for urgent attention; not to mention that a significant 37% of the global population is still excluded from Internet access (ITU, 2021).

Further, digital acceleration has come with the heightened problem of cybersecurity challenges (ITU, 2020a). The adjustment of strategies by Governments in response to pandemics by promoting an increased reliance on digitalization, could also risk opening new digital divides besides exacerbating those that have proved persistent over the years (OECD, 2020). So, against the backdrop of massive disruptions caused by COVID-19, a wider purview is required in order to address market resilience (ITU, 2020b). Thus, if the infrastructure and regulatory environment does not perform in response to these socio-economic demands, it will negatively impact the whole digital ecosystem (ITU, 2020b). Further, the responses taken must be guided by a carefully reviewed model which this study is premised to investigate and report on.

Many governments, Kenya included, have learned from these hard lessons and have taken concrete, actionable measures by actively deploying policies aimed at improving the resilience of digital infrastructure amidst COVID-19 market shocks. The market shocks have come from the consideration that the value of digital connectivity has experienced an upward shift as a result of the pandemic. This upward shift is likely to affect consumer demand as well as public policies, particularly toward digital inclusion for under-represented population. It is also likely that Governments and consumers will consider connectivity as a necessity, and may even begin to identify Internet access as a basic human right, something that was only viewed as a “nice to have,” prior to COVID-19 crisis (World Bank, 2020). Nevertheless, the pertinent question is whether the responses by the Government are achieving effective outcomes, that might not only solve the immediate problem of the COVID-19 pandemic shocks but might also help tackle the persistent digital divide and safeguard current gains (ITU, 2020b). Universal digital connectivity is an enabler of the development of the digital economy and a catalyst for inclusive growth, innovation and sustainable development (OECD, 2020). It is therefore essential for these policies to ensure widespread, affordable, fast and trustworthy connectivity for all citizens.

1.2 Digital Economy

The digital economy is a concept whose definition is constantly evolving but is understood as a condition that started in the 1990s with the emergence of the Internet. Early definitions (Tapscott, 1996, Lane 1999, Mesenbourg, 2001) focus specifically on the Internet as the mainstream technology behind the digital economy. Later definitions added new technologies such as mobile and sensor networks (DBCDE, 2009), cloud computing and big data (G20 DETF, 2016). Today, the core of the digital economy is hinged on the use of ICTs in all economic sectors to produce digital goods and services. Bukht et al., (2017) define digital economy as *“that part of economic output derived solely or primarily from digital technologies with a business model based on digital goods or services”*. Sometimes, digital economy is understood *“less as a concept and more as a way of doing things”* (Elmasry et al. 2016) but a simple and straightforward definition is that it is *“an economy based on digital technologies”* (EC 2013). Mesenbourg (2001) segments the digital economy into digital technology infrastructure and the use of ICTs for other economic processes. But in the latter category, he starts to look beyond the spotlighting of e-commerce to also add the use of ICTs to conduct other business processes. The digital technology infrastructure which comprises computer and networking hardware and software as well as digital connectivity form the foundation of digital services.

For developing countries, there is significant promise that the growth of the digital economy can boost economic growth, raise productivity of capital and labour, lower transaction costs and facilitate access to global markets (Dahlman et al., 2016). The growth of the digital economy is currently pegged at 15-25% per year in emerging markets (WEF, 2015). However, alongside these opportunities, though, are various challenges. There are dangers of exclusion from opportunities, for example, due to low levels of digital skills and technology penetration both within and between countries (Dahlman et al. 2016). There are also dangers of the digital economy of heightened problems of cybersecurity and privacy specifically within developing countries (Manyika et al., 2013).

With the proliferation of Information Technology (IT), the old economy has given way to a new economy that focuses on providing services rather than on optimizing the industrial production of goods in which the exchange of information and software plays a key role (Weinhardt et al., 2021). According to Weinhardt (2021), digital economy is one of the new economic models including platform economy, sharing economy, circular economy, token economy, distributed ledger technology economy, Internet economy, gig economy, on-the-fly computing economy, and attention economy that leverage technological innovations. Nonetheless, the digital economy for the longest time has co-existed alongside the physical industry economy, but the recent phenomenon of COVID-19 has raised the urgency of digital economy resulting in a shift from the business norms of the physical economy to a seemingly fully technology-driven economy.

1.3 Kenya as an Emerging Digital Economy

Kenya's Digital Economy Blueprint envisages *"A nation where every citizen, enterprise and organization have digital access and the capability to participate and thrive in the digital economy"*. The Blueprint defines the Digital Economy as *"the entirety of sectors that operate using digitally-enabled communications and networks leveraging Internet, mobile and other technologies"* (ICTA, 2020). At the core of this vision is the realization of the role that ICTs play in this socio-economic transformation where knowledge is believed to be the future source of prosperity. ICTs are a powerful tool, which if deployed effectively and impartially, presents enormous opportunities to boost the economic and social welfare of citizens. In recognition of this, the Government of Kenya has adopted the use of ICTs to foster efficient and accountable delivery of services to citizens through the e-Government initiative. Further, the adoption of ICTs has enabled the creation of new businesses with a variety of services and products that are accessible in both local and global markets. Indeed, this has resulted in employment creation, which translates into an improvement in the quality of life of Kenyans, as well as increased connectedness and other auxiliary benefits to citizens. According to the Kenya National Economic Survey report of 2021, the value of output from the ICT sector rose by 2.5 per cent to Kenya Shillings 535.5 billion in 2020 compared to a growth of 5.7 per cent registered in 2019 (KNBS, 2021). ICTs have truly become a critical catalyst for the development of virtually every sector of the economy.

1.4 Impacts of COVID-19 on the Digital Economy

The COVID-19 pandemic has provided a sudden and strong impetus for businesses and individuals to adopt or increase their use of digital tools to continue economic activities. By accelerating digitalization and deepening the reliance on digital technologies, COVID-19 has boosted the importance of ICT-related goods and services in global trade (UNCTAD, 2021). ICT services grew to almost 14% of total services exports worldwide in 2020, while digitally deliverable services overall increased to nearly 64% of total services exports (UNCTAD, 2021). It is evidently clear that digital technologies have supported economic resilience during the COVID-19 crisis, preventing large parts of the economy from coming to a complete standstill (OECD, 2020). It is also clear that digital infrastructure witnessed a positive demand shock due to businesses shifting online and consumers working from home (Karishma et al, 2020).

This shock, however, was lower in low- and middle-income countries, where the informal sector constitutes a large share of economic activities, thereby limiting the enforcement of social distancing and work from home arrangements. By accelerating digitalization,

COVID-19 appears to have boosted trade in ICT goods and services, which had declined before the pandemic. However, the pandemic-related acceleration in digitalization has also exacerbated digital divides, with least developed countries being left further behind. According to Boh et al. (2021), the COVID-19 pandemic has introduced new ways of working and living, and with the need for social distancing to mitigate the spread of the COVID-19 virus, people have experienced the need to adjust to sudden changes in their routines, adapting to a new way of living, such as working from home, online learning, and reduced physical contact and social gatherings.

1.5 Market Resilience in Kenya's Digital Economy during COVID-19

The onslaught of COVID-19 pandemic saw the Kenyan Government imposing a shutdown on major cities in attempts to implement social distancing practices and slow down the spread of the life-threatening virus. Such shutdowns brought corporeal economic activities close to a complete standstill thus sparking concerns of large-scale economic recession or even economic collapse (Nicola et al. 2020). Despite this, amidst the bleak economic outlook, certain sectors appeared to have performed better. Reports have indicated that even as most corporeal economic activities halted, trade and consumption continued to take place online as consumers were spending more time and money online as the virus peaked (Huang et al. 2020). Similar to other types of natural disasters or major incidents, COVID-19 is an unexpected large-scale incident which has profoundly impacted global economy and market-wide shocks. However, the new digital world has made the COVID-19 pandemic's impact on the global economy different from that of previous epidemics. The development of digital technologies in the past two decades has changed the way people and firms interact with each other. With the fast-growing Internet users worldwide, online shopping has become one of the most popular online activities.

In Kenya, a study by MasterCard on consumer spending revealed that nearly four out of five (79%) surveyed consumers are shopping more online since the onset of the COVID 19 pandemic (MasterCard, 2021). In the aftermath of the COVID-19 pandemic, it is evident that digital technology and connectivity played an essential role in combating the adverse effects of the pandemic and in enhancing societal and economic resilience (Atsuko & Karazhantva, 2020). Even as COVID-19 threatened to stall much of the brick-and-mortar based economic activities, reports showed that digitally-enabled economic activities and business transactions are not only taking place online but have grown during the pandemic (Baig et al., 2020; Huang et al., 2020). Digitization or digital transformation, as witnessed in Kenya is defined by the changes the country has gone through when it started embracing digital technologies to develop new digitally-enabled goods and services and create more value for its citizens (Kane et al., 2019; Liu et al. 2011; Schallmo et al., 2017). The digital transformation has given Kenya the ability to perform better amidst the pandemic as firms were more capable of maintaining some degree of operation and revenue stream for their businesses, thus enabling market resilience. At the onset of the COVID-19 pandemic, when shops and factories closed due to social distancing regulations, firms that had embarked on digital transformation responded better than those that had not. They conducted some of their business activities digitally (Blackburn et al. 2020; Huang et al. 2020) instead of facing a complete standstill. Thus, during the COVID-19 pandemic, the market reacted more favourably towards firms and sectors with a higher level of digital transformation and more negatively towards the laggards.

1.6 Kenya's Response to the COVID-19

On 11 March 2020, COVID-19 was declared a 'pandemic' by the Director-General of the World Health Organization (WHO, 2020). As at, 11 March 2020, there had been more than 118,000 cases in 114 countries, and 4,291 people had lost their lives (WHO, 2020). In the absence of a vaccine to curb the spread of the highly contagious COVID-19 virus, countries around the world were forced to take preventive measures in the form of imposing social distancing and declaring country-wide lockdowns (Kaplan et al., 2020). This restricted cross border travel, suspended production, and the global supply chain came to a halt.

In Kenya, the first case of COVID-19 was confirmed by the Ministry of Health on 12 March 2020 (MoH, 2020). The case was a Kenyan citizen who had travelled back to Nairobi from the United States of America via London, United Kingdom on the 5th March 2020. On 15 March 2020, President Uhuru Kenyatta announced a lockdown of the country with the closure of educational institutions, suspension of international flights except for cargo and evacuation planes, and reduction of public transportation capacity to below 60% among other stringent measures to contain the pandemic. During the first phase of COVID-19 lockdown in Kenya, citizens experienced unprecedented situations, leading to an unparalleled preference shift among consumers. Commodities were classified into essential and non-essential goods and services, with non-essential goods and services showing a decline in demand (Enormous, 2020). Changes in the choice of purchase destination, type of goods and services purchased and adoption of digital payment, were observed during the nationwide lockdown (Enormous, 2020). Since all elements of the economy are intricately interrelated with public health measures and lockdown, this resulted in economic and social disruptions hinting toward change in market dynamics.

The restrictions imposed by the Kenyan Government in response to the COVID-19 pandemic had significant impacts on labour supply and productivity, which in turn increased the cost of internal trade and altered the demand for certain commodities and services. Furthermore, the changes to the international context led to lower demand for Kenya's top export commodities including cut flowers and fruits, while border restrictions had an impact on the regional trade of livestock. In addition, with income of the diaspora being impacted by the economic downturn in other countries, the remittances to households were also significantly reduced (World Bank, 2020). Movement restriction adversely affected the tourism sector, which is Kenya's largest foreign exchange earner. Without an increase in net foreign currency inflows through external loans and aid, the reduction in exports together with lower remittances led to the depreciation of the Kenya Shilling, which further impacted consumer prices and purchasing power (KNBS, 2020b).

Consumer behaviour is the mental, emotional and physical activities that people engage in when selecting, purchasing, using and disposing of products and services so as to satisfy needs and desires (Priest, et al., 2013). The COVID-19 pandemic lockdown and social distancing control measures disrupted consumer lifestyle and buying patterns as well as shopping habits, necessitating consumers to improvise and learn new habits. At the beginning of the pandemic, many consumers rushed to stockpile food, especially fresh agricultural products in order to ensure food security for the family. This was a sign of the pandemic's impact on changing customer behaviour towards a new phase of purchasing that did not exist pre-COVID-19 (Laato, 2020). In the late stages of the

pandemic, consumers started adopting digital online channels for most of their needs and wants especially in the countries that faced lockdown restrictions (Alaimo, 2020). The use of digital technologies increased, leading to the spike in Internet traffic by up to 60% shortly after the outbreak (OECD, 2020). The Internet proved to be a significant ally as people moved almost all their activities to the online sphere.

Use of technology also came in handy for Kenya with the integrated disease surveillance and response (IDSR) system which has been adopted to guide the rapid detection, reporting, management and treatment of the reported infection cases. In addition, sentinel surveillance of influenza-like illnesses and other acute respiratory infections using the global influenza surveillance and response system (GISRS) allowed robust monitoring of community transmission of COVID-19, and provided insight into co-circulation of respiratory viruses. The Ministry of Health communicated daily via all media outlets and reported the number of confirmed cases, fatalities, recoveries, and overall COVID-19-related bed occupancy in various hospitals, and the prevalence in all 47 counties in the country.

In addition, the government established the COVID-19 risk communication and community engagement sub-committee, in conjunction with media agencies, healthcare stakeholders and the International Organization for Migration (IOM) to enhance strategic communication and community engagement, promote trust and influence risk perception. During the pandemic mental health and social support issues escalated, for example, due to loss or grief for lives which necessitated deployment of community health workers to resolve them. Further, in order to stimulate economic activity and safeguard livelihoods, the government also unveiled an 8-point economic stimulus program that was also incorporated in its national budget 2020/2021. A cash transfer programme targeting the elderly, poor and vulnerable was also launched. Small and Medium Enterprises on the other hand were provided with seed capital through a credit guarantee scheme, and in addition, tax refunds and other pending payments by Government were fast-tracked. Additional healthcare workers were hired and bed capacities in public hospitals were expanded. Small scale farmers were issued with an e-voucher scheme for supply of farm inputs and a special loan fund for the hospitality industry was implemented. There were massive developments in provision of clean water through rehabilitation of wells, water pans and underground tanks in arid and semi-arid areas and community water points (Wangari et al., 2021).

With the support of the Association for Progressive Communications (APC), the Kenya ICT Action Network (KICTAnet), the UK Prosperity Fund Digital Access Programme (the Foreign & Commonwealth Development Office initiative), and the University of Strathclyde, the Communications Authority developed a licensing and a shared spectrum framework for community networks in response to COVID-19 pandemic (CA, 2021). This framework was aimed at addressing universal access communication barriers and ICT services faced by communities in underserved areas. It proposed expanding the range of license-exempt spectrum to capitalise on WI-FI success; access to Television White Spaces (TVWS) to allow community networks and small network operators greater flexibility in the establishment of broadband backhaul links to connect networks. It also focused on resolving underlying efficiency challenges in the radio frequency spectrum and its optimal use for instance through spectrum sharing. It had several action plans including integration of community network licenses in the unified license framework;

amending the EIRP limits for 2.4GHz and 5 GHz Wi-Fi for Point-to-Point (PtP) and Point-to-Multipoint (PtMP) use; lowering the barrier to use of other license-exempt bands for PtP and PtMP use, including 24 GHz and 60 GHz; and expanding the range of frequencies available for license-exempt use - especially in the 5GHz - 6 GHz bands. It also established an incubatory period for TV Whitespace (TVWS) technologies, developed a shared spectrum framework for under-utilized International Mobile Telecommunications (IMT) spectrum bands and reviewed the spectrum fee framework by recognizing the need for significantly reduced fees for underserved areas.

1.7 Scope of the study

The scope of the study was limited to the capacity of the country to respond to the thematic area of emergency communications and performance statistics based on reports from the Communications Authority (2018-2021). The study evaluated the market resilience baseline of when COVID-19 struck, the responses undertaken and their effects on market resilience after the pandemic.

A LPIC-SMART evaluation model was used to review the market resilience from the perspectives of **L**eadership & Governance; **I**nfrastructure and Resources; **P**reparedness; and **C**ooperation (LIPC). Questionnaire items were used to score the market resilience levels as **S**tarting; **M**oderate; **A**dvanced; **R**obust and **v**er**T**erbrate (SMART

1.8 Aim of the Research

The study aims to assess market resilience in emerging digital economies, a case study of Kenya (MoICT, 2020) during the COVID-19 pandemic.

1.9 Specific objectives

The specific objectives of the study are:

- i. To determine the market resilience maturity status in Kenya during the COVID-19 phenomenon.
- ii. To report on the market changes experienced in Kenya during the COVID-19 phenomenon.
- iii. To determine the interventions that were taken for market resilience in Kenya during the COVID-19 phenomenon.
- iv. To evaluate the effects of the market resilience responses undertaken in Kenya during the COVID-19 phenomenon.

1.10 Research Questions

The research intended to answer the following questions:

- i. What was the market resilience's maturity status of Kenya when COVID-19 phenomenon occurred?
- ii. What were the market resilience changes experienced in the case of Kenya during the COVID-19 phenomenon?
- iii. What were the intervention responses taken for market resilience in Kenya during the COVID-19 phenomenon?
- iv. What were the effects of the market resilience responses undertaken in Kenya during the COVID-19 phenomenon?

2. LITERATURE REVIEW

2.1 Introduction

This section covers a presentation of the literature review on market resilience and the theory of change adopted in the study. It is intended to bring into perspective the context of Kenya and market resilience issues during the COVID-19 pandemic. It also reviews the literature on the Smart Mature Resilience (SMR) framework model that was adopted as a model for analysis of Market Resilience Status in Kenya.

2.2 Market Resilience

Resilience refers to the capacity to tolerate major external shocks, while maintaining core attributes and continuing to learn, adapt and develop responses to change (Boh et al., 2021). It is the ability of people, households, communities, countries, and systems to mitigate, adapt to, and recover from shocks and stresses in a manner that reduces chronic vulnerability and facilitates inclusive growth. In a developmental perspective, resilience, refers to the continuing ability to use internal and external resources successfully to resolve issues, while in an infrastructural perspective, it is a characteristic of resistance to future negative events (Park et al., 2015). It also refers to the capacity of a system to maintain and renew itself particularly in the presence of stressors, or the ability of the system to absorb or cushion itself against damage or loss (Rose, 2004). Although markets are complex adaptive systems (Holling, 2001), the capability of the market to respond and recover to disturbances is a strategic matter (Floetgen et al., 2021; Park et al., 2015a). Therefore, market resilience in Kenya in response to the COVID-19 pandemic shocks would give credit to the role played by the digital networks. Market systems practitioners will define market resilience as the ability of market systems to allocate resources, draw on system-level resources (such as social safety nets, social capital, the financial system, or government assistance), and innovation to solve problems in the face of shocks and stresses (Downing, et al., 2018).

In this study, market resilience was taken as the ability of the market to self-regulate and provide affordable prices to end-users by maintaining a diverse and competitive market (ITU, 2021; Garnett, 2021). Further, the study recognized that market resilience, is part of the Connect2Recover methodology (ITU, 2021) where it referred to the competitiveness and market concentration based on HHI, and on affordability of services. The definition provided by Garnett (2021) and the reflection of the Connect2Recover market resilience was used to set the focus of the study.

2.3 NETP Guidelines on Market Resilience

The National Emergency Telecommunication Plan (NETP) Guidelines by ITU (2020) sets out a strategy to enable and ensure communications availability during the disaster mitigation, preparedness, response and recovery phases. It is intended to promote coordination across all levels of government, between public and private organizations, and within communities at risk. The flexible Guidelines suited for adoption in response to any kind of disaster that a country may face, including a full typology of disasters: climatological, hydrological, meteorological, geophysical, and biological disasters. The Guidelines include procedures for conducting an overall risk assessment for a country and describes the topics that should be included in the country's NETP. In regard to disaster management, the Guidelines set out the step-by-step processes for a country's NETP. Further, the Guidelines also outline the legal and regulatory framework, the administrative structure, processes and communication protocols that should exist in national governments for the implementation of the NETP. The Guidelines also address

issues related to regulation of communications, specifically, aspects regarding equipment imports, licensing of services, and the administration and planning of radio spectrum; and the potential to increase the ability of the regulator to address particular needs with greater flexibility. In addition, the Guidelines also specify aspects of how networks and telecommunication/ICT services can be used in an emergency, and the existing international cooperation and coordination mechanisms, as well as how they can be implemented by a given country. There is an emphasis on continuous training, simulation drills and capacity building for all parties involved in the response to an emergency, as well as measures and activities that should be considered to help people with specific needs during emergencies, including children, the elderly, and persons with disabilities (ITU, 2020). There was no evidence of adoption of these Guidelines by Kenya.

2.4 Smart Mature Resilience (SMR) framework model

The LPIC-SMART evaluation model is a resilience evaluation model that uses the perspectives of **L**eadership and Governance; **I**nfrastructure and Resources; **P**reparedness; and **C**ooperation elements. Questionnaire items were used to score the Market Resilience levels as **S**tarting; **M**oderate; **A**dvanced; **R**obust and **v**ertebrate (SMART). The context of the SMR can be traced to the European project funded by the Horizon 2020 program (H2020). The SMR project took the perspective that European resilience should rest on a resilience backbone in which cities act as the vertebrae and the collaboration among them would lead to creating this backbone (Hernantes, Marañá, Gimenez, Sarriegi, & Labaka, 2019). It was intended to provide a Resilience Maturity Model (RMM) path for operationalizing resilience by defining a sequence of stages that could apply in progressing towards a resilient backbone. The RMM is a strategic tool designed to provide cities with a roadmap towards enhanced resilience. It provides a holistic overview of the resilience building process and helps end users to understand resilience as a multidimensional objective. The Model has been used to enable cities to assess their current maturity stage and to identify the policies to implement in order for the city to evolve and move to the next maturity stage. This resilience model has been applied in the SMR Project towards a nexus of resilience across selected cities in Europe for a strong backbone where the cities can support one another in overcoming the challenges arising from risks with adequate preparedness for whatever shocks and stresses that may arise.

While pandemics are not unique to humanity, COVID-19 went on to defy the world's order in many ways at an unusual global scale. Further, the territorial dimension of the COVID-19 crisis placed subnational governments - regions and municipalities - at the frontline of crisis management and recovery (OECD, 2020). It is on this backdrop that the LPIC-SMART framework would be seen to be a favorable candidate for adoption for escalation from RMM for cities to national, subnational and regional applications. While the intent of the RMM in the cities' resilience was to ensure the ability to resist, absorb, adapt to and recover from acute shocks and chronic stresses so as to keep critical services functioning, market resilience on the other hand focuses on the ability of the market to self-regulate and provide affordable prices to end-users by maintaining a diverse and competitive market. Therefore, the object of resilience is similar except that application in this study is at a macro level. In both, the application is to achieve adaptive resilience abilities and strengthen preparedness by anticipating and appropriately responding to future challenges.

This SMR resilience model comprises five maturity stages (**S**tarting, **M**oderate, **A**dvanced, **R**obust and **VerTebrate**) of building resilience from a strategic approach. Each maturity stage contains dimensions of policies that can be used to build resilience that have been grouped into four main categories: **L**eadership and Governance, **I**nfrastructure and resources, **P**reparedness, and **C**ooperation; and a set of stakeholders, whose cooperation and involvement should be markedly evident within that maturity stage are also considered. The set of indicators identified for monitoring and assessing the performance of each of these policies and to justify their investments in resilience are also specified. In this study, this model was used through administration of a questionnaire with items for LIPC policies based on 10 subdimensions (with adaptation to subnational, national and regional levels of analysis). The subdimensions were: L: Leadership and Governance (L1: Municipality, cross-sectorial and multi-governance collaboration, L2: Legislation development and refinement, and L3: Learning culture (learning and dissemination), L4: Resilience action plan development); P: Preparedness (P1: Diagnosis and Assessment, P2: Education and Training); I: Infrastructure and resources (I1: Reliability of actors and their interdependences, I2: Resources to build up resilience and to response); C: Cooperation (C1: Development of partnerships with stakeholders, C2: Involvement in resilience networks of local, national, and regional bodies) and scored the respondents' views on the item's resilience status 1=Insignificant (to represent Starting), 2=Moderate, 3=Advanced, 4=Robust and 5=Very Robust (to represent verTebrate). Further, the framework also includes the steps to follow in order to successfully implement these resilience policies (SMR, 2018).

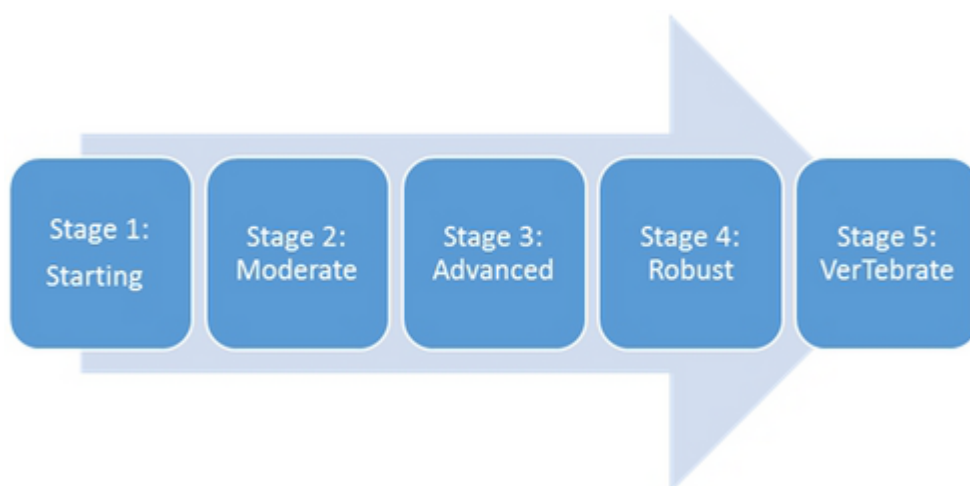


Figure 1: Stages of Resilience Maturity (SMR, 2018)

Source: SMART Mature Model 2018

2.5 Theory of change

A theory of change is a method that explains how a given intervention, or a set of interventions, are expected to lead to a specific developmental change, drawing on a causal analysis based on available evidence. It is a description of why a particular way of working will be effective, showing how change happens in the short, medium and long term to achieve the intended impact. It can be represented in a visual diagram, as a narrative, or both (UNDG, 2017). This study's theory of change was developed at the beginning to describe the resilience status in the country, mitigation interventions taken and the effects, and the resilience status after COVID-19, as the situation unfolded.

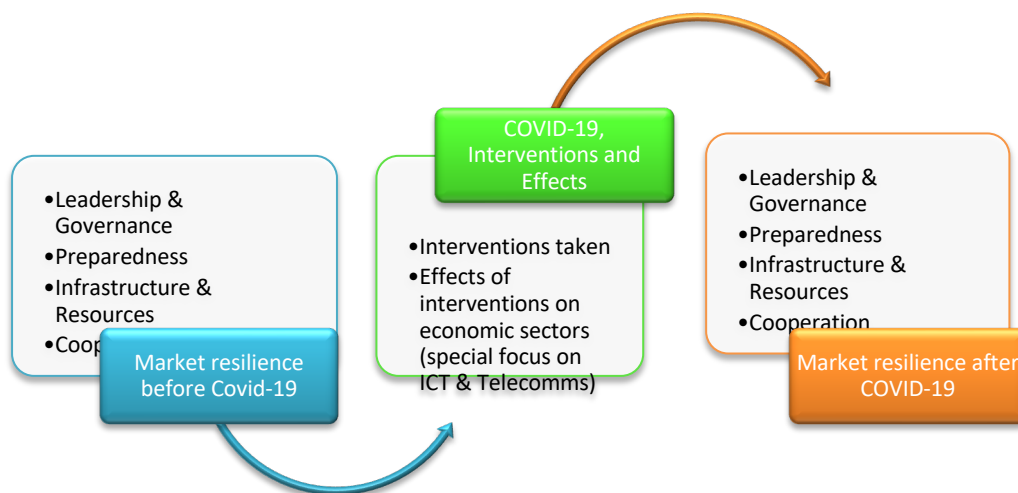


Figure 2: Theory of Change

Source: O’Flynn and Sonderskov (2015).

Secondary data was obtained from the Communications Authority and analyzed to show trends on subscriptions, usage of bandwidth and other relevant statistics so as to give insights into the capacity of the country’s network availability during the disaster mitigation, preparedness, response and recovery phases. The findings would then form the basis for recommendations on necessary interventions for promoting coordination across all levels of government, between public and private organizations, and within communities at risk for resilience during disasters such as the COVID-19 pandemic.

3. APPROACH AND METHODOLOGY

3.1 Introduction

This section summarizes the approach and methodology adopted for the study in details. The project tasks and deliverables were divided into three (3) phases: Phase 1: Project Inception and Design, Phase 2: Data Collection and Analysis, and Phase 3: Completion of Final Deliverables. During Phase 1, an Inception meeting was conducted and duties were assigned to the project team members. The scope of work was defined and an Inception report was written to include project communication strategy, literature review, data collection tools, and their evaluation for validity and reliability. This Inception report was then submitted to ITU as a deliverable. Phase 2 involved piloting the data collection tools followed by the actual data collection for both primary data and secondary data. The data sources were identified and initial contacts were made for the data collection plan to be refined. The collected data was coded and captured in the data analysis systems - including Microsoft Excel and SPSS for quantitative data. Qualitative data was captured in textual narratives in Microsoft Word, then filtered for thematic and content analysis using Microsoft Excel and the output was converted into a Text map and selected verbatim quoted statements were extracted into Microsoft Word. The results of the findings were compiled into the draft report and presented in a stakeholders’ validation workshop. Remarks given from the validation workshop were incorporated into the Final

Draft Report in Phase 3 of the project, and then submitted to ITU for review. Upon the review, ITU gave their input on the required corrections and improvements. These were implemented to make this Report that was then submitted for the completion of the study, and consideration for adoption.

3.2 Research Approach and Methodology

Kenya regards itself as an emerging digital economy (MoICT, 2020). Therefore, the overall objective of this research project was to evaluate the Market Resilience in Emerging Digital Economies based on a Case Study of Kenya, during COVID-19 Pandemic. An exploratory research study design, with mixed methods of qualitative and quantitative research, was adopted. Both primary and secondary data were collected. Secondary data was collected from the Communications Authority (CA) of Kenya, the Kenya National Bureau of Statistics (KNBS), IMF, and the World Bank. Primary data on the other hand was obtained using a questionnaire and an interview from selected relevant government bodies, public and private organizations that were significantly involved in providing critical digital services during the COVID-19 pandemic, and consumer/professionals organizations that acted as umbrella bodies for various sector players in Kenya. Data collected was analysed with quantitative statistical and qualitative content analysis methods and is presented later in this report.

3.3 Data Collection Methods

To obtain primary data close-ended and open-ended questionnaires and interviews were used as well as interview guides. These questionnaires were administered online using Google Forms due to prevailing COVID-19 constraints. Interviews, on the other hand, were administered using remote conferencing tools and through mobile calls. After data collection, analysis and compiling of the draft report, a focus group discussion was conducted via a remote conference meeting to validate the findings. The invited participants included the Communication Authority, Government Ministries and selected Government agencies representatives, County Government officers, Telecommunication Service Providers, Consumer groups and Professional bodies who were selected on the basis of their active role in various responses towards COVID-19 pandemic phenomenon in Kenya. The Association for the Physically Disabled of Kenya (APDK) was also invited to represent special group of citizens such as those living with disabilities.

Secondary data was gathered from three authoritative Government agencies sources: the Communications Authority (CA) of Kenya, the Kenya National Bureau of Statistics (KNBS), and the World Bank. The CA is the regulatory authority for the communications sector in Kenya responsible for facilitating the development of the information and communications sectors, including broadcasting, cybersecurity, multimedia, telecommunications, electronic commerce, postal and courier services. KNBS is the principal agency of the Government responsible for collecting, analysing and disseminating statistical data in Kenya. The data collected from the CA website was the sector statistics report that provided an overview of the performance and trends of the communications sector for the period 2018 to 2021 on the following service categories: (1) Mobile Telephony Services, (2) Fixed Telephony Services, (3) Data/Internet Services, (4) Broadcasting Services, (5) Postal and Courier Services, and (6) Cyber Security Landscape.

3.4 Data Analysis Model

The analysis of the data was done on both qualitative and quantitative data. The qualitative data ranged from open-ended survey questions to in-depth interviews obtained during the data collection. This data was annotated and classified into themes and then analysed using content analysis. The content analysis was intended to assist in uncovering richer insights from the data so as to describe the observations and to make required inferences. Quantitative data, on the other hand, was gathered from the close-ended questionnaires and secondary country was analysed using Microsoft Excel and SPSS. The findings were represented into visualization graphs and charts, and descriptive statistics. These findings were then discussed so as to make conclusions on the study objectives and to make recommendations to different target audiences.

4. DATA ANALYSIS AND FINDINGS

Data was collected to answer the four key questions - (1) What was the market resilience maturity status of Kenya when COVID-19 phenomenon occurred? (2) What were the market resilience changes experienced in the case of Kenya during the COVID-19 phenomenon? (3) What were the intervention responses taken for market resilience in Kenya during the COVID-19 phenomenon? and (4) What were the effects of the market resilience responses undertaken in Kenya during the COVID-19 phenomenon? The scope of the study was limited to the capacity of the country to respond to the thematic area of emergency communications and performance statistics based on reports from the Communications Authority (2018-2021). The study evaluated the market resilience baseline of when COVID-19 struck, the responses undertaken and their effects on market resilience after the pandemic.

4.1 Market Resilience Status in Kenya During the COVID-19 Phenomenon

The study first endeavoured to determine the market maturity status in Kenya during COVID-19 phenomenon. Its data collection and analysis focused on an array of policy dimensions measurements proposed by SMAR (2018) in the LIPC-SMART model. They comprised of Leadership and Governance, Infrastructure and resources, Preparedness, and Cooperation (LIPC) which were mapped into 5 scales of Resilience status, namely: Starting, Moderate, Advanced, Robust and verTerbrate (SMART). This model has been used for strategic planning to help identify the level of resilience maturity and consequently help in prioritizing resilience policy implementation on the basis of diagnosis and assessment. A questionnaire based on the SMR framework was dispatched using Google Forms to n= 83 selected institutions. A Likert Scale of 1 to 5 was used in order to measure the observed resilience status 1=Starting, 2=Moderate, 3=Advanced, 4=Robust and 5=verTerbrate. The institutions were selected using multi-stage sampling method where all 21 ministries and 47 county Governments were selected by census, and 15 state corporations out of a total of 248 were selected based on random sampling by Cochran (1977) sampling technique (where 99% population proportion on the parastatals affected by the phenomenon was assumed). From the total sample size, there were 47 responses and all were completed sufficiently for analysis. This represented a 57% response rate and it was deemed sufficient based on Nulty (2008). The findings of the analysis are summarized below:

Table 1: Text map of Market Resilience Status of Kenya During the COVID-19 Pandemic

ELEMENTS	National Government	Subnational (County) Government	Regional & Global Representation	Overall Resilience Maturity
Leadership & Governance (L1)	Advanced	Advanced	Advanced	Advanced
Leadership & Governance (L2)	Advanced	Advanced	Advanced	Advanced
Leadership & Governance (L3)	Advanced	Advanced	Advanced	Advanced
Leadership & Governance (L4)	Advanced	Moderate	Advanced	Advanced
L_OVERALL	Advanced	Moderate	Advanced	Advanced
Preparedness (P1)	Moderate	Moderate	Advanced	Moderate
Preparedness (P2)	Advanced	Advanced	Advanced	Advanced
P_OVERALL	Advanced	Moderate	Advanced	Advanced
Infrastructure & Resources (I1)	Advanced	Moderate	Advanced	Advanced
Infrastructure & Resources (I2)	Advanced	Moderate	Advanced	Advanced
I_OVERALL	Advanced	Moderate	Advanced	Advanced
Cooperation among agencies(C1)	Advanced	Advanced	Advanced	Advanced
Cooperation among agencies(C2)	Advanced	Moderate	Advanced	Advanced
C_OVERALL	Advanced	Advanced	Advanced	Advanced
Overall_RESILIENCE	Advanced	Moderate	Advanced	Advanced

Source: Analysis of research responses using the SMART Model

The specific items in the questionnaire and the analysis are provided below in a sequence: Leadership and Governance (item L1 to L4), Infrastructure and resources (item I1 and I2), Preparedness (items P1 and P2), and Cooperation (items C1 and C2).

Question L1

How was the country's leadership and governance towards disasters and emergencies (i.e. Did it at least have a mandated multi-sectoral agency or coordinating department for this)?

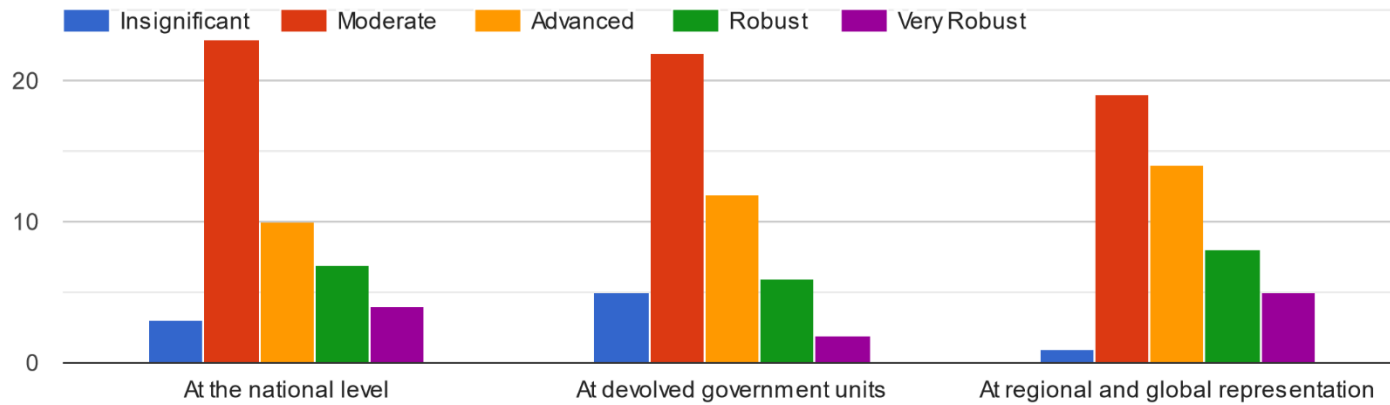


Figure 3: Graphical analysis of question L1
Source: Analysis of research responses using the SMART Model

Question L2

How was the state of legislation for managing disasters and emergencies resilience in the country (i.e. Existence of laws, policies, guidelines, certification and enforcement of conformity, monitoring and reporting etc.)?

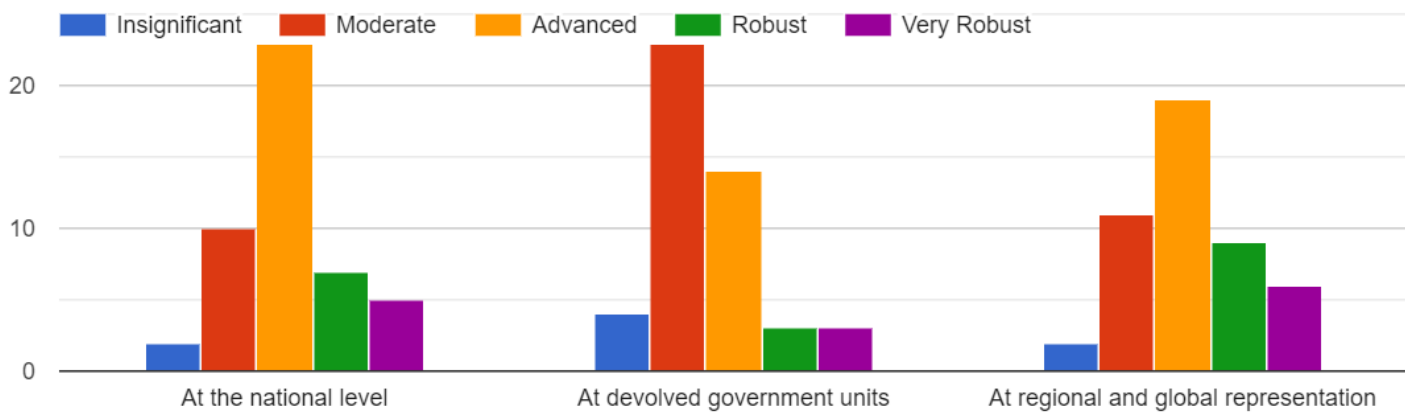


Figure 4: Graphical analysis question L2
Source: Analysis of research responses using the SMART Model

Question L3

What was the extent of learning and knowledge dissemination for managing disasters and emergencies resilience in the country (i.e. Existence of training programmes, use of innovations such as artificial intelligence, big data, best practice code, critical mass of trained experts, formal evaluation of preparedness, drills, etc.)?

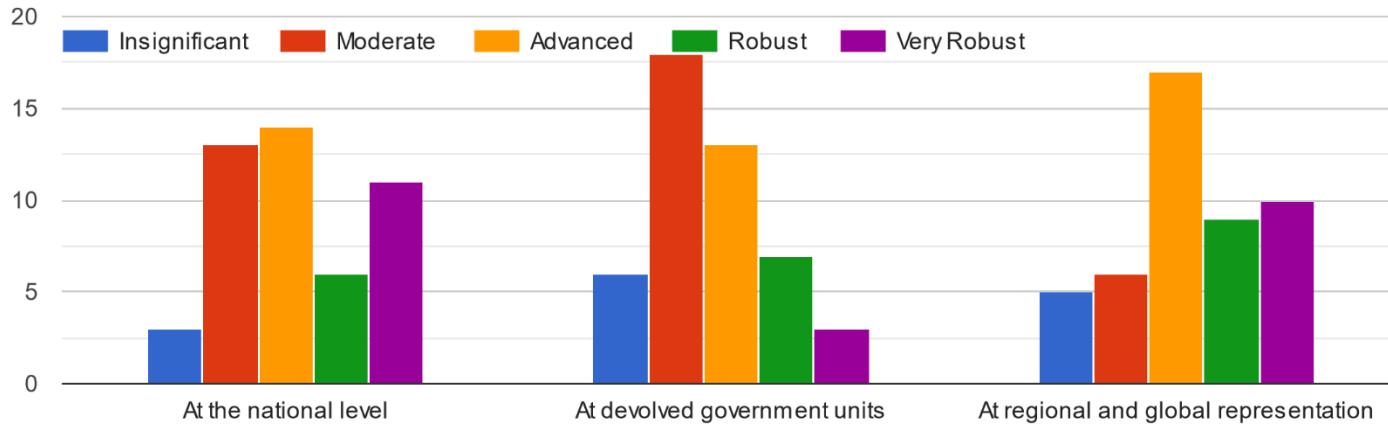


Figure 5: Graphical analysis of question L3
Source: Analysis of research responses using the SMART Model

Question L4

How developed was the action plan for managing disasters and emergencies resilience in the country (i.e. Existence of annual work plans, data collection and analysis of requirements, indicators of performance, M&E framework, emergency communication systems, etc.)?

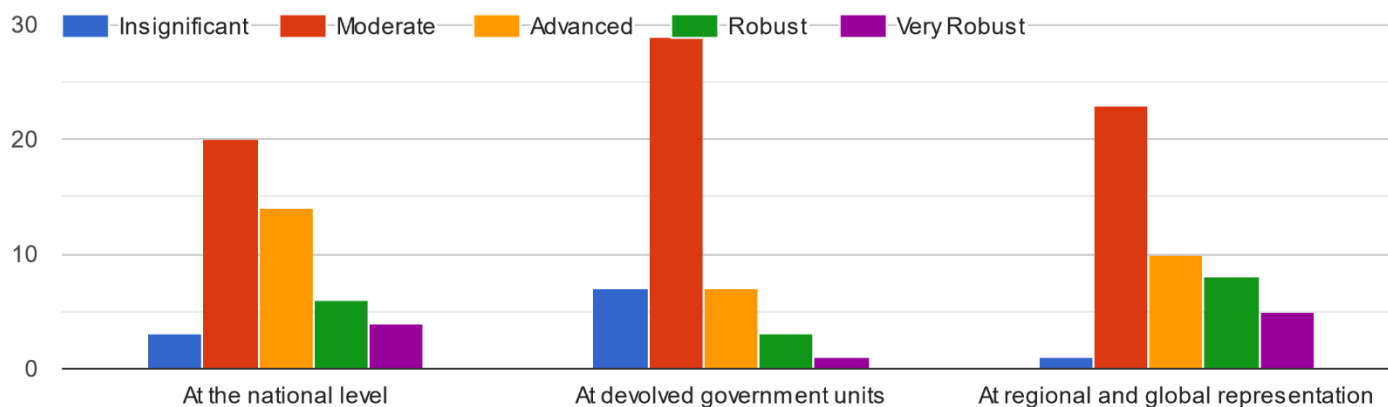


Figure 6: Graphical analysis of question L4
Source: Analysis of research responses using the SMART Model

Question I1

What was the country's state of preparedness for disasters and emergencies for resilience (i.e. Did it have the risks management systems, updated risk registers, risk response plans, contingencies for service affordability and availability for poor and vulnerable, etc.)?

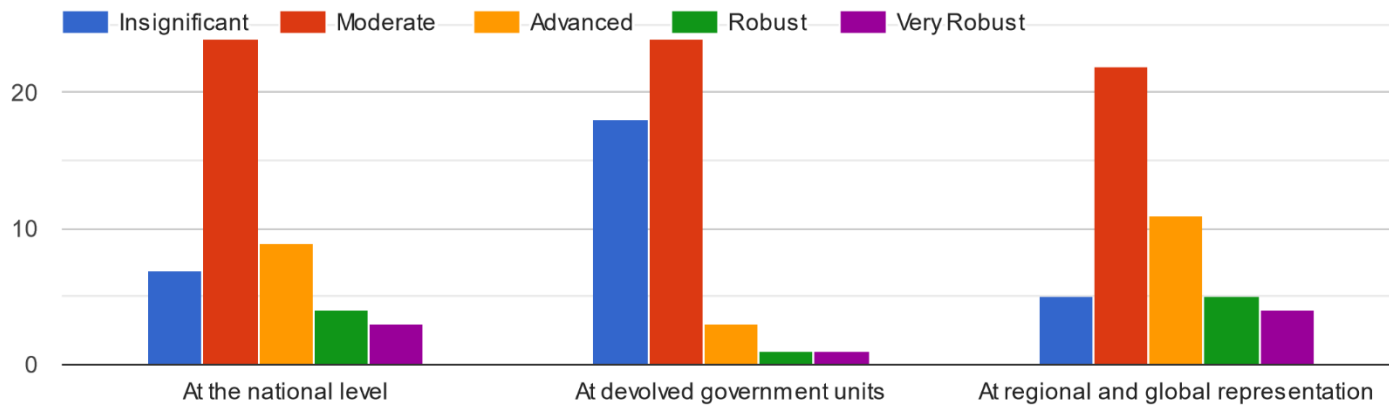


Figure 7: Graphical analysis of question I1
 Source: Analysis of research responses using the SMART Model

Question I2

How was the adequacy of manpower development in disasters and emergencies for resilience (i.e. Continuous development of teams including volunteers, experts, multi-stakeholder such as public and private companies and communities, etc.)?

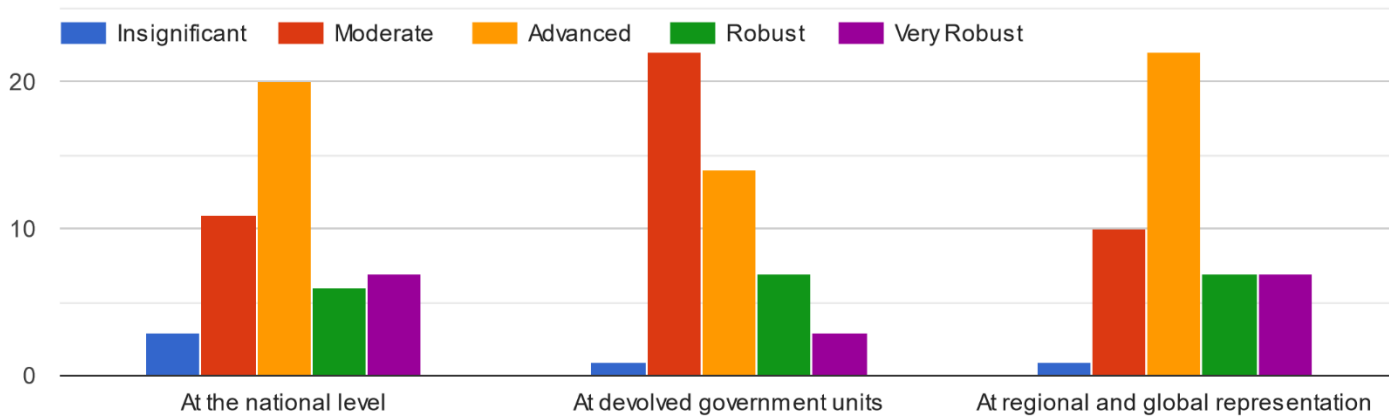


Figure 8: Graphical analysis of question I2
 Source: Analysis of research responses using the SMART Model

Question P1

How was the nature of development of critical infrastructures to handle disasters and emergencies for resilience (i.e. Health, security, redundant communication networks, essential service delivery units, rapid evacuation exit routes - that apply to your sector; for instance, ICT sector include spectrum policy and strategic content distribution for emergencies.)?

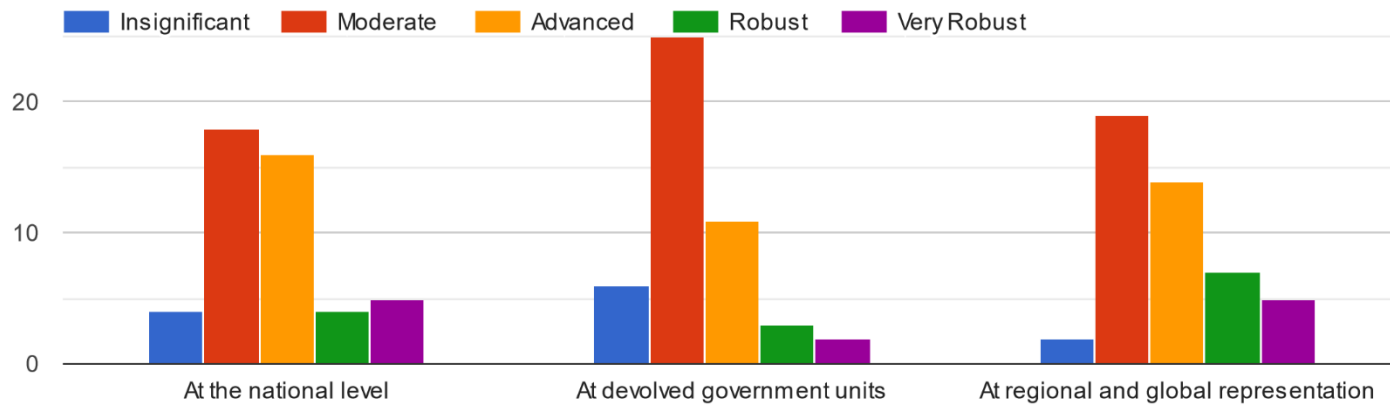


Figure 9: Graphical analysis of question P1
Source: Analysis of research responses using the SMART Model

Question P2

How adequate were the resources set aside to cater for disasters and emergencies for resilience (i.e. Budget, Human Resources, Equipment and machinery, physical, logistical, insurance, resilience innovations, etc.)?

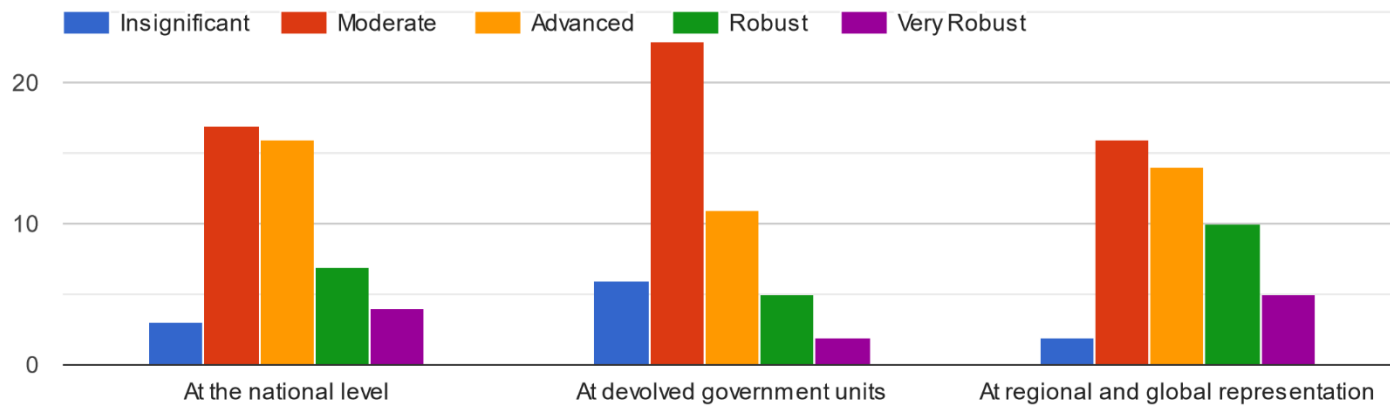


Figure 10: Graphical analysis of question P2
Source: Analysis of research responses using the SMART Model

Question C1

What was the nature and quality of partnerships that the country had to cover disasters and emergencies for resilience (i.e. Mapping of service providers, cooperation with stakeholder engaged and well coordinated, information sharing etc.)?

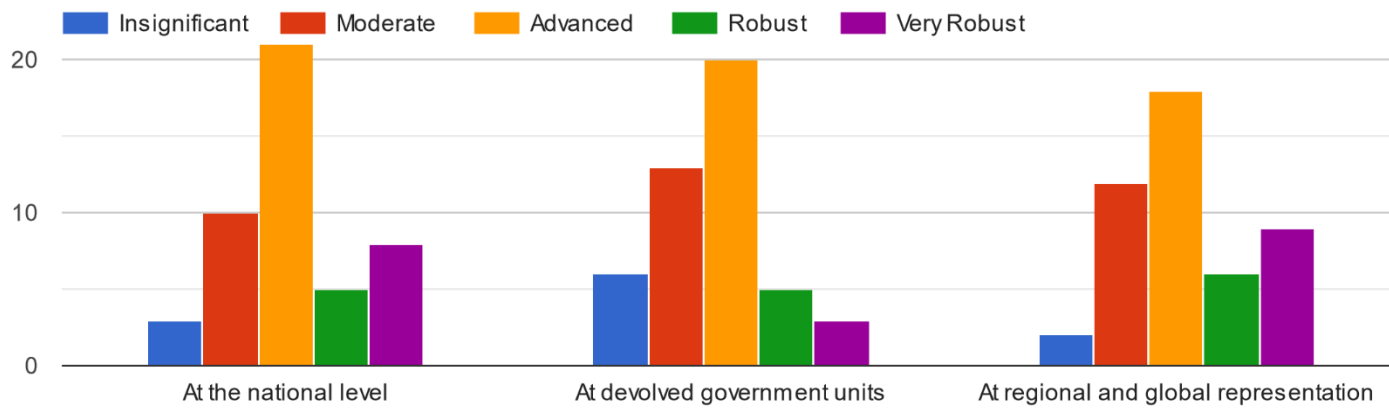


Figure 11: Graphical analysis of question C1
Source: Analysis of research responses using the SMART Model

Question C2

How much were the disasters and emergencies alliances (i.e Formal alliances relevant institution, interdependent departments, consumers associations, specialized service providers, etc.)?

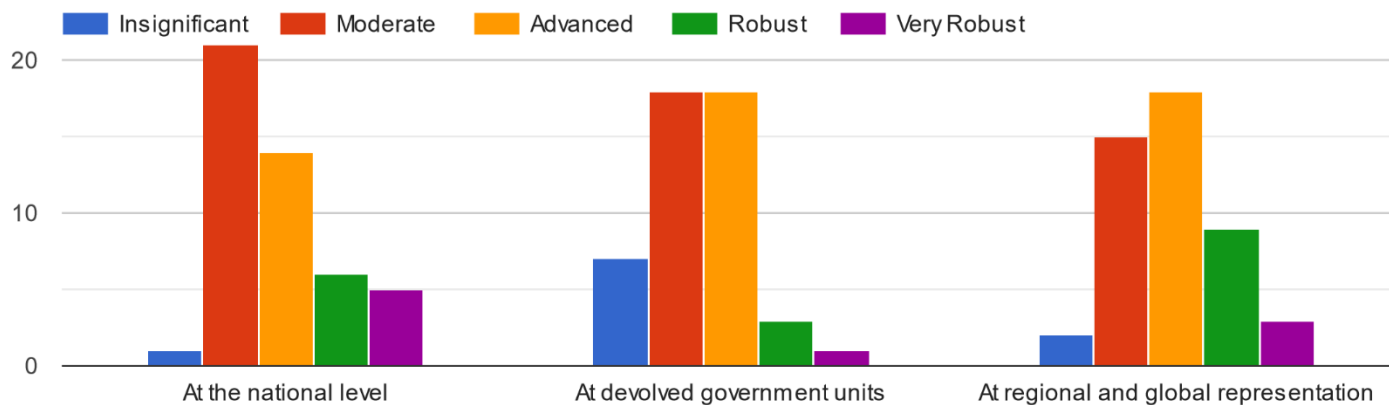


Figure 12: Graphical analysis of question C2
Source: Analysis of research responses using the SMART Model

4.2 Market changes experienced in Kenya during the COVID-19 pandemic

Secondary data was collected on the market changes experienced in Kenya during the COVID-19 pandemic from lead institutions that monitor Kenya's market specific data. They included the World Bank, International Monetary Fund (IMF), the Kenya National Bureau of Statistics (KNBS), the Central Bank of Kenya (CBK), and the Communications Authority (CA).

4.3 Overview on the Performance of the Kenya's Economy

According to the World Bank, GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or depletion and degradation of natural resources. The data collected from the IMF World Economic Outlook showed that Kenya's GDP experienced a major decline in 2019-2020 period as shown in Figure 13 below.

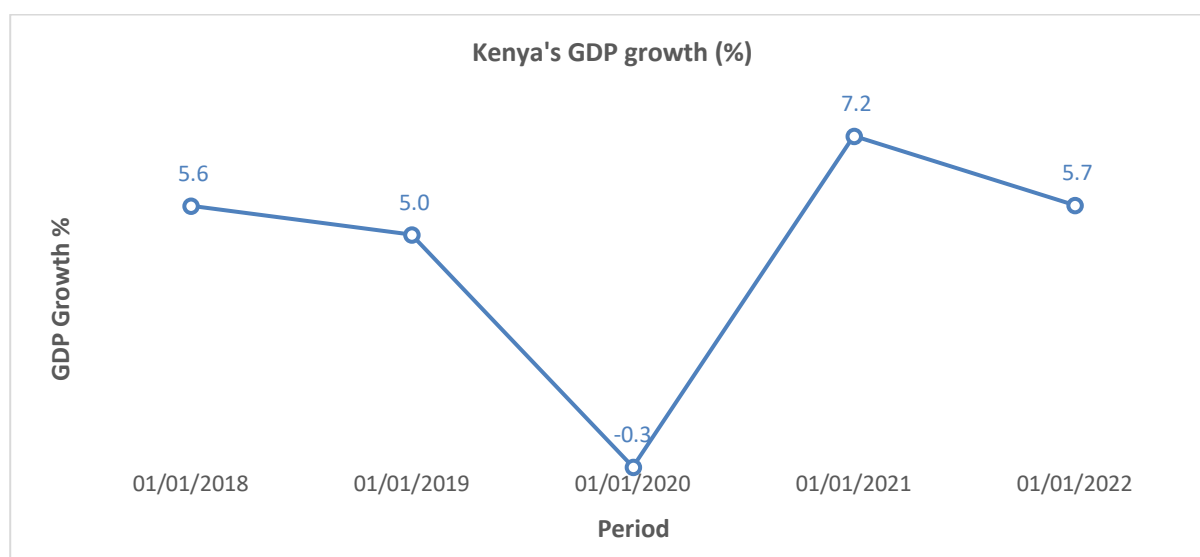


Figure 13: Kenya's economic performance (GDP Annual Growth, Source: IMF, 2022)

On the other hand, KNBS (2020) reported that the Real GDP for Kenya was estimated to have contracted by 0.3 per cent in 2020 compared to a revised growth of 5.0 per cent in 2019. The report went on to state that Kenya's economy was adversely affected by COVID-19 and the consequent containment measures both domestically and internationally. During this period, the Government's new monetary policy was premised on the need to cushion the economy from the adverse effects of the COVID-19 pandemic in the face of its various containment measures by supporting liquidity and credit access. The Central Bank of Kenya made important attempts to lower cost of borrowing money by reducing its Central Bank Rate (CBR) from 8.50 per cent in November 2019 to 8.25 per cent in January 2020, and later to 7.25 per cent and 7.00 per cent in March and April 2020, respectively. Later, the CBR was maintained at 7.00 per cent until the end of 2020. These interest rates were, therefore, more favourable to economic activities in 2020. Despite the Government's efforts to stabilize the economy, the inflation rate of the country rose marginally from 5.3 per cent in 2019 to 5.4 per cent in 2020, mainly attributed to moderate increase in food prices (KNBS, 2021).

In view of the country's economic data, it is clear that the temporal restrictive measures undertaken to curb the spread of the virus had serious negative impacts on some key sectors of the economy. These temporal measures included ban of local and international travel; cessation of movement in and out of some counties and zones; and closure of educational facilities, leisure and eating places. Unfortunately, these effects in the end had profound negative effects on the economy and livelihoods. The restriction in movement and the need for social distancing led to disruption in labor supply, while a reduction in household disposable incomes led to reduced demand for goods and services. Further still, many businesses, especially those related to tourism and educational activities closed down during the second quarter of 2020. However, some recovery of economic activities was witnessed in the third quarter of 2020 with partial lifting of some of the measures. Further improvements were notable during the fourth quarter of 2020 with further easing of controls. Therefore, by and large, the containment measures could be said to have adversely constrained the economy from realizing its full potential.

4.4 Performance of Kenya's Telecommunications Sector

Table 1 below represents the performance of Kenya's telecommunications sector in the years 2018 to 2021. The presentation of these findings has been selectively extracted according to the scope of the study and presented in Figures and the corresponding discussions.

Table 2: Telecommunications Statistics 2018-2021

KENYA'S TELECOMMUNICATION STATISTICS		YEARS				% CHANGES		
INDICATORS	Units	2018	2019	2020	2021	2019	2020	2021
Mobile Subscriptions	Millions	46.5	52.7	58.4	64.1	14%	11%	10%
Fixed Subscriptions	Unit	68,352	55,656	18,150	14,208	-19%	-67%	-22%
VOICE TRAFFIC IN MINUTES								
Mobile On-Net Voice Traffic	Billions	12.3	13.2	13.7	14.59	7%	4%	6%
Mobile Off-Net Voice Traffic	Billions	1.6	1.7	1.7	1.7	4%	1%	1%
International Incoming Mobile Voice Traffic	Millions	142.4	142.4	138.2	144.67	0%	-3%	5%
International Outgoing Mobile Voice Traffic	Millions	106	106	106	109	0%	0%	3%
Roaming-out (Own Subscribers)	Millions	48.19	51.47	55.2	58.87	7%	7%	7%
Roaming-in (Foreign Subscribers)	Millions	42	46	50	54	10%	7%	8%
Total Local Fixed network traffic	Millions	0.59	0.58	0.56	0.57	-2%	-2%	1%
Fixed VoIP Traffic		150,464	141,871	160,021	162,386	-6%	13%	2%
MOBILE SMS TRAFFIC								
SMS On-Net	Billions	14.93	15.02	15.59	16.05	1%	4%	3%
SMS Off-Net	Millions	915	733	529	286	-20%	-28%	-46%
International Incoming SMS	Millions	11.49	10.75	10.81	10.54	-6%	1%	-3%
International Outgoing SMS	Millions	9.2	8.9	8.9	9.9	-3%	0%	11%

MOBILE MONEY TRANSFER SERVICES								
Number of Active Registered Mobile Money Transfer Subscriptions	Millions	30.05	30.79	31.53	31.9	3%	2%	1%
Number of Registered Mobile Money Agents	Pcs	212,903	218,113	224,215	228,383	2%	3%	2%
Number of Transactions-Sending and Withdrawal	Millions	698.28	673.56	723.46	706.31	-4%	7%	-2%
Value of Transactions- Sending and Withdrawal (KSh.)	Trillions	1.98	2.05	2.11	2.04	3%	3%	-3%
Number of Mobile Commerce Transactions	Millions	524.66	548.9	569.26	543.86	5%	4%	-5%
Value of Mobile Commerce Transactions (KSh.)	Trillions	1.52	1.66	1.79	1.81	9%	8%	1%
Value of Person-to-Person Transfers (Ksh.)	Billions		737.1	754	724.33		2%	-4%
DATA/INTERNET SERVICES								
Data/ Internet Subscriptions	Millions	41.28	43.97	46.18	48.63	7%	5%	5%
Broadband Subscriptions	Millions				25.2			
Total Available International Bandwidth (Gbps)	Gbps	3,932	4,290	4,648	4,835	9%	8%	4%
Total Used International Bandwidth (Gbps)	Gbps	992	1,050	1,152	1,285	6%	10%	12%
BROADCASTING SERVICES								
Number of free-to-air TV channels	Unit	68	73	76	79	7%	5%	4%
Number of Radio FM stations	Unit	171	172	173	173	1%	1%	0%
Digital Terrestrial Television Signal Population Coverage (%)	Unit	86	86	86	86	0%	0%	0%
POSTAL AND COURIER SERVICE								
Postal Outlets	Unit	623	623	623	623	0%	0%	0%
Private Courier Outlets	Unit	1,020	1,027	1,027	1,027	1%	0%	0%
Number of Letters (Up to 350 gms) Posted Locally	Millions	6,529	6,528	6,527	3,558	0%	0%	-46%
Total Courier Items Sent Locally	Millions	128,928	179,049	400,514	551,149	39%	124%	38%
International Incoming Letters	Millions	2.08	2.2	2.37	2.38	6%	8%	1%
International Outgoing Letters (Up to 350 gms)	Millions	1.03	1.09	1.15	1.13	6%	5%	-2%
CYBER SECURITY								
Total Cyber Threats	Millions	40.7	23.58	21.58	18.32	-42%	-9%	-15%
Total Cyber Reports	Pcs	6,130	8,778	12,211	14,923	43%	39%	22%

Source: CA Report of 2018/2021

According to the statistics obtained from the CA in Kenya for the Telecommunications Sector in years 2018-2021, the sector experienced mixed outcomes in the period between 2019 and 2021 when the COVID-19 phenomenon was in process. The specific outcomes are reported in the subsections that follow below.

4.4.1 Mobile and Fixed Line Subscriptions

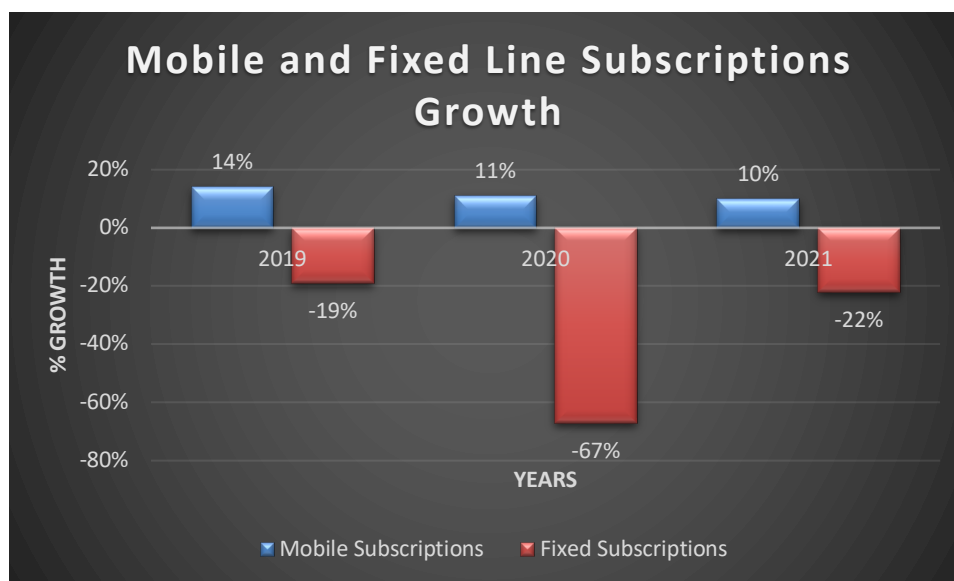


Figure 14: Mobile subscriptions

Source: CA Report of 2018/2021

As shown by Table 2 and Figure 14 above, the number of active mobile subscriptions in the country continued on an upward progression however the annual growth rate declined during the COVID-19 pandemic period of 2018/2019 to 2020/2021. According to CA (2019), penetration level of mobile subscriptions stands above 100 per cent of Kenya's population. The oversubscription could be attributed to consumers with multiple SIM ownership who took advantage of the competing voice and/or data plans offered by the various service providers. The high mobile SIM penetration has also been attributed to the increasing availability and access to mobile network signals and a variety of convenient mobile services (CA, 2019). Therefore, the decline on the growth of active mobile subscriptions might have occurred due to the saturation of the penetration and the decreased economic activities during the COVID-19 pandemic.

The fixed lines subscription in Kenya encountered negative growth rate throughout the COVID-19 pandemic period, with the highest drop of 67% occurring in 2019/2020 period due to the Government's COVID-19 control measures that required people to work remotely to effect social distancing. Most of the fixed line services are used by corporate users who could not access their physical premises.

4.4.2 On- Net and Off-Net Mobile Voice Traffic

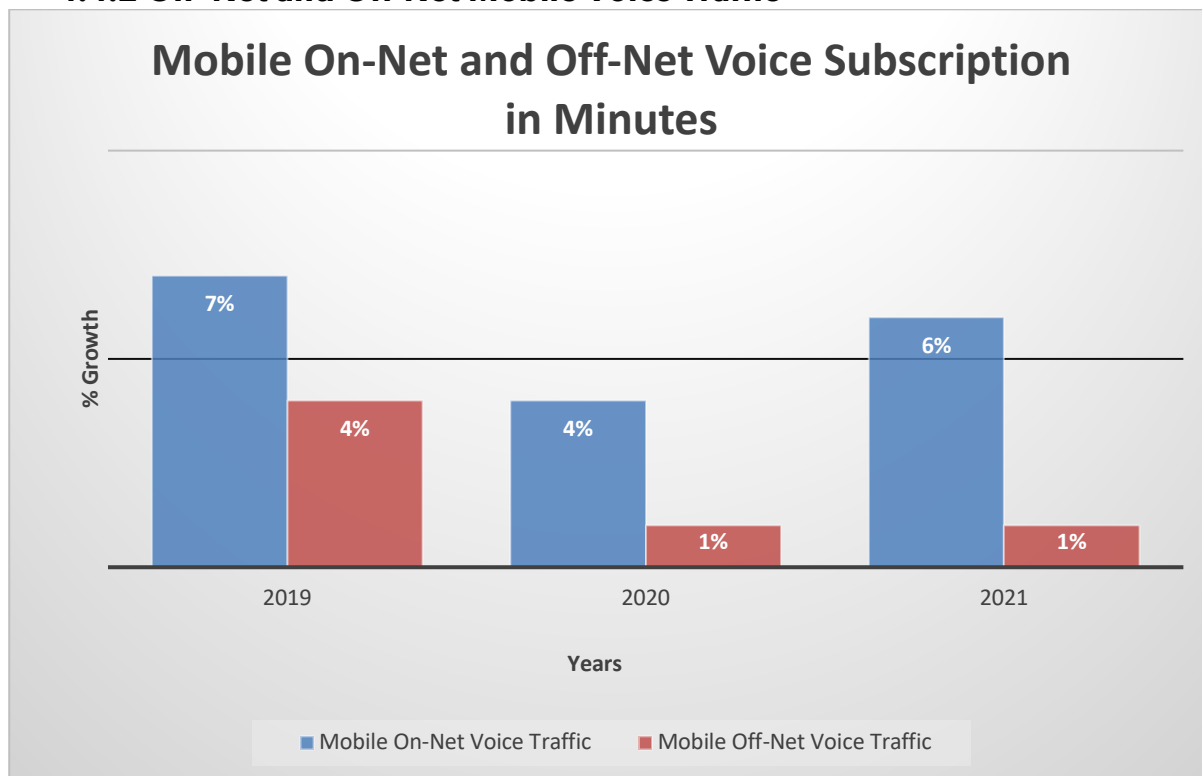


Figure 15: On-Net and Off-Net Mobile Voice Traffic

Source: CA Report of 2018/2021

Figure 15 above shows that in the period of COVID-19 and especially during year 2020, the on-net calls traffic encountered some significant decline. The findings indicate that during the COVID-19 period, the off-net mobile voice traffic also encountered some significant decline. The decline of the growth of on-net and off-net traffic in the COVID-19 pandemic period could be attributed to the decreasing economic activity especially in 2019/2020 period when the major economic lockdown occurred as shown by the depression of the growth rates. Mobile calls across networks declined during the pandemic period which led to decline in inter-operator revenues. This can be attributed to the existing mobile termination rates between operators that made these calls undesirable by consumers. On-Net calls traffic pattern seemed to have followed the lockdown restrictions regime by the government. The findings imply that pandemic induced drop in economic activities could have reduced mobile call traffic in both on-Net and off-Net Voice calls.

4.4.3 International Incoming and Outgoing Mobile Voice Traffic

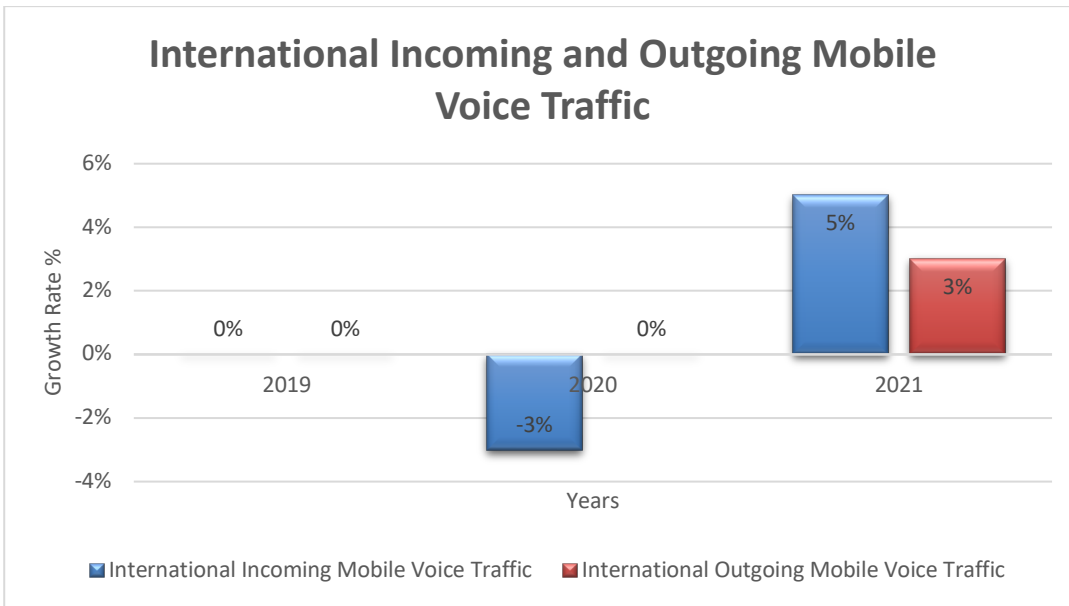


Figure 16: International Incoming and Outgoing Mobile Voice Traffic

Source: CA Report of 2018/2021

From Figure 16, we observed a decline in the international incoming mobile voice traffic in 2020, but recovery was achieved in 2021. Due to the reduced business activities in 2019 and 2020 occasioned by the social distancing policies instituted by the government, communication between Kenyan businesses and individuals and the international community was curtailed. The observed growth in 2021 in Mobile incoming voice traffic could be attributed to the phased out or lifting of social distancing restrictions as the infection rates of COVID-19 declined.

4.4.4 Roaming Out and Roaming In Voice Traffic in Minutes Growth

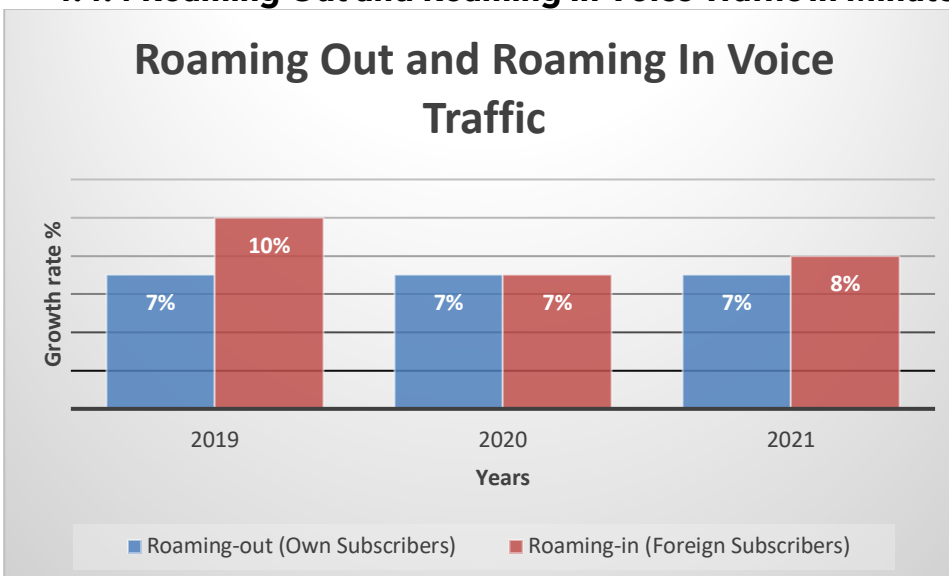


Figure 17: Roaming Out and Roaming In Mobile Voice Traffic

Source: CA Report of 2018/2021

As indicated in Figure 17 during the COVID-19 pandemic there was a drop in the growth rate of roaming in voice traffic. This drop in growth rate could have been occasioned by the reduced number of foreign travellers in Kenya due to the international travel restrictions. The lack of international travellers meant that there was a reduction in the utilisation of local infrastructure resulting in reduced revenues generated from this service by operators, hence impacted on overall Kenyan GDP growth during the period of the study.

4.4.5 Total Local Fixed Network Traffic and Fixed VoIP Traffic Growth

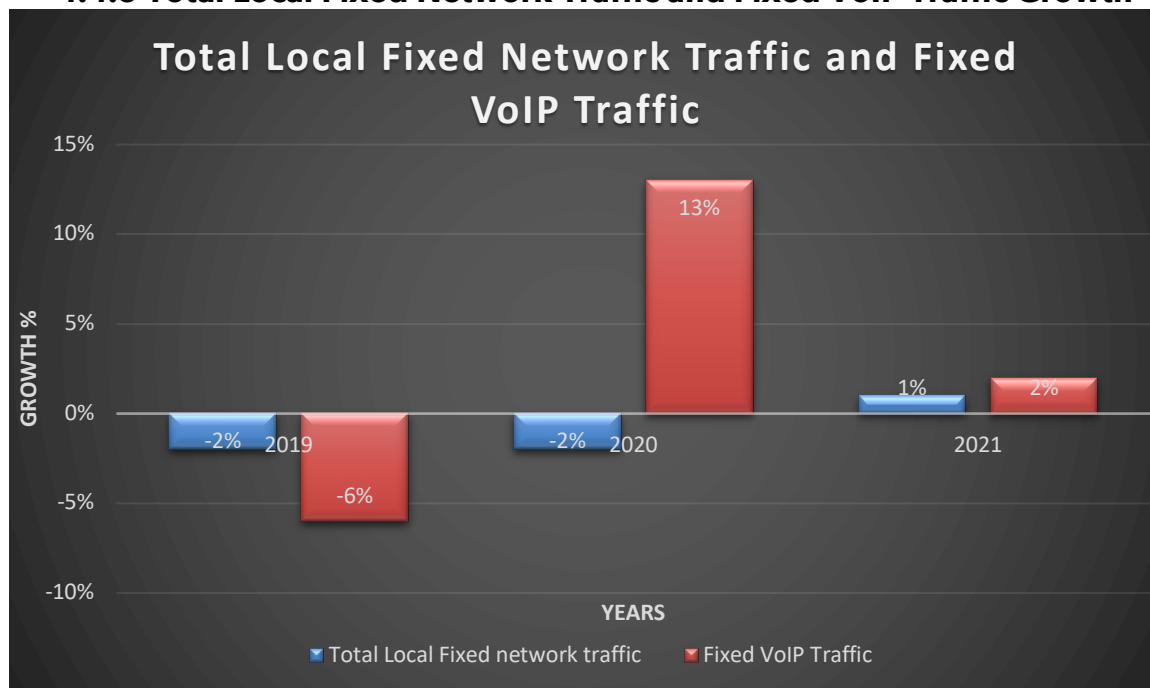


Figure 18: Total Local Fixed Network Traffic and Fixed VoIP Traffic

Source: CA Report of 2018/2021

During the COVID-19 pandemic, total local fixed network traffic reflected a decline as indicated in Figure 18 above. This could have been occasioned by the nature of the fixed network that is only available at the physical offices, which were not accessible during the lockdown. However, with the easing of the Lockdown, the use of fixed VoIP traffic recorded a huge surge as corporate businesses resorted to fixed VoIP for business transactions. Businesses lost significant revenue from fixed VoIP Networks during the early phases of the pandemic as many workers were forced to work from home without contingent Fixed Network connectivity to their homes. Communication Service Providers providing Fixed VoIP services experienced a sharp increase in revenues in 2020 as social distancing measures begun to be lifted by the government leading to gradual return to work places.

4.4.6 On-Net and Off-Net Mobile SMS Traffic

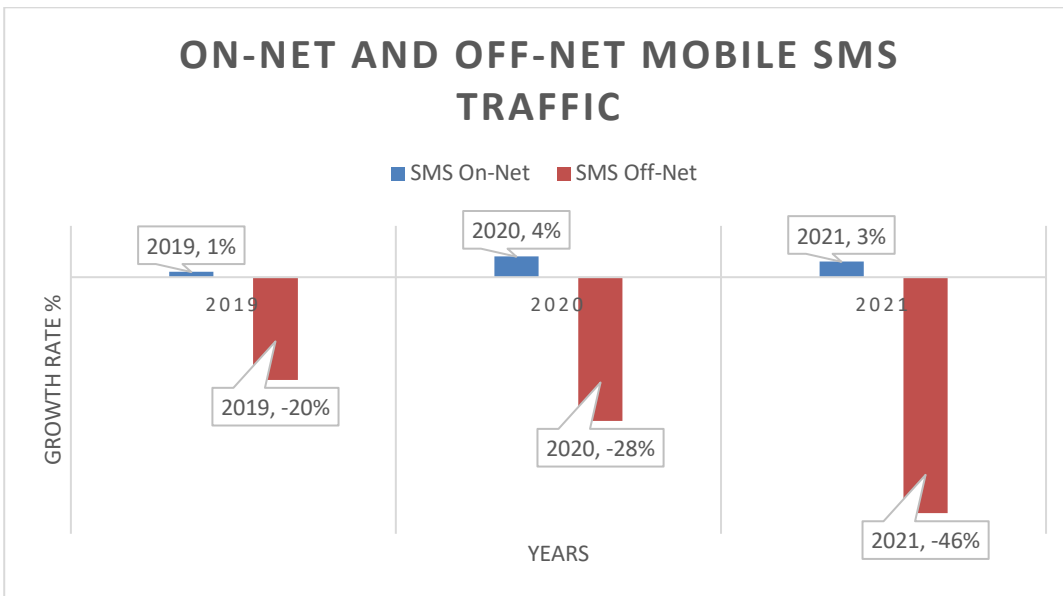


Figure 19: On-Net and Off-Net Mobile SMS Traffic

Source: CA Report of 2018/2021

The indications from Figure 19 are that during the major lockdown in Kenya, there was a slight surge in SMS on-net usage. It is also visible that off-net SMS traffic is experiencing rapid decline. While the decline does not seem to reflect the impact of COVID-19, it nevertheless calls for urgent evaluation and adoption of necessary interventions. The marked rise in on-net SMS traffic is an indicator that during the pandemic SMS was a preferred mode of communication. However, the continued decline in off-net SMS traffic could point to the negative effects of Mobile Termination Rates between the operators.

4.4.7 International incoming and international outgoing mobile SMS traffic

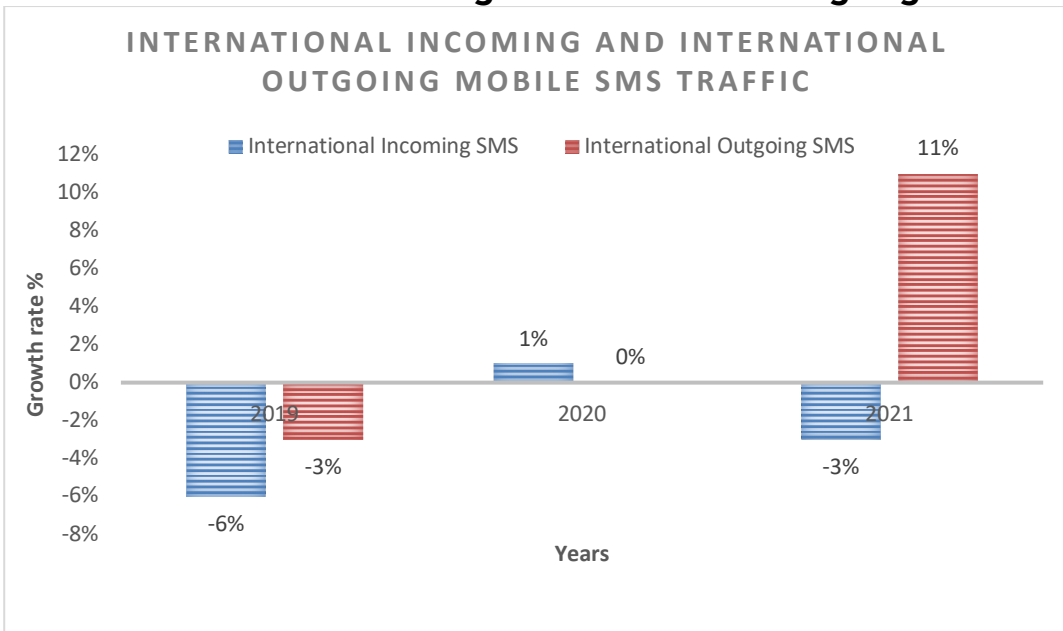


Figure 20: International incoming and international outgoing mobile SMS traffic

Source: CA Report of 2018/2021

As per Figure 20, the indication is that, although international incoming traffic was generally declining, the major lockdown period of 2020 caused an increase in international incoming SMS traffic. In the same period, the international outgoing SMS increased from 8.9 to 9.9million SMS traffic from the year 2019 to 2021. This indicates that COVID-19 reversed the decline in international outgoing traffic and the trend continued into 2021. The decline in the international SMS traffic in the early stages of the pandemic indicates the effects of reduced business activity between Kenya and other countries. However, in 2021, the revenues for operators on outgoing international SMS increased substantially while there was a marginal decrease in incoming international SMS with global easing of COVID-19 restrictions of business and international travel - where Kenya is a major tourism destination.

4.4.8 Mobile Money Services

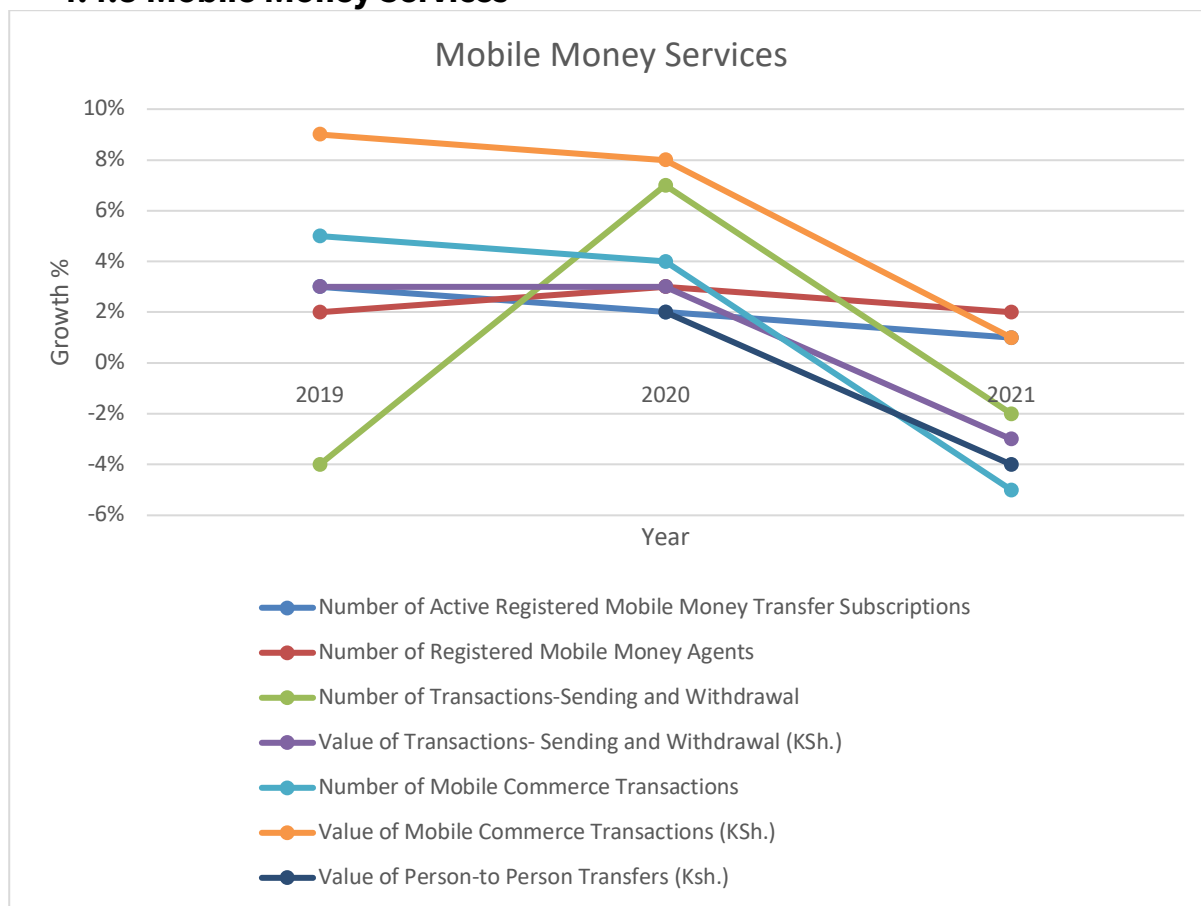


Figure 21: Mobile Money Services

Source: CA Report of 2018/2021

The findings indicated that during the period of 2019, 2020, and 2021 only the number of transactions (sending and withdrawal) and the number of registered mobile money agents increased during COVID-19 major lockdown. While all the other indicators including the value of transactions and active registered mobile money transfer subscriptions declined. It is important to note that the Government of Kenya had directed the service providers to waive transaction charges for amounts not exceeding Kshs 1,000.00 (approximately \$10.00). This directive seems to have increased the number of transactions in mobile money transfers during its implementation period in year 2020 only. Whereas such a directive might have cushioned the very low-income individuals in

the population, it also denied revenue for the operators. The recorded general decline in all mobile money services indicators in the year 2021 is a strong indicator of significant real economic challenges that Kenyans are facing in the post-COVID-19 era.

4.4.9 Data/Internet Services

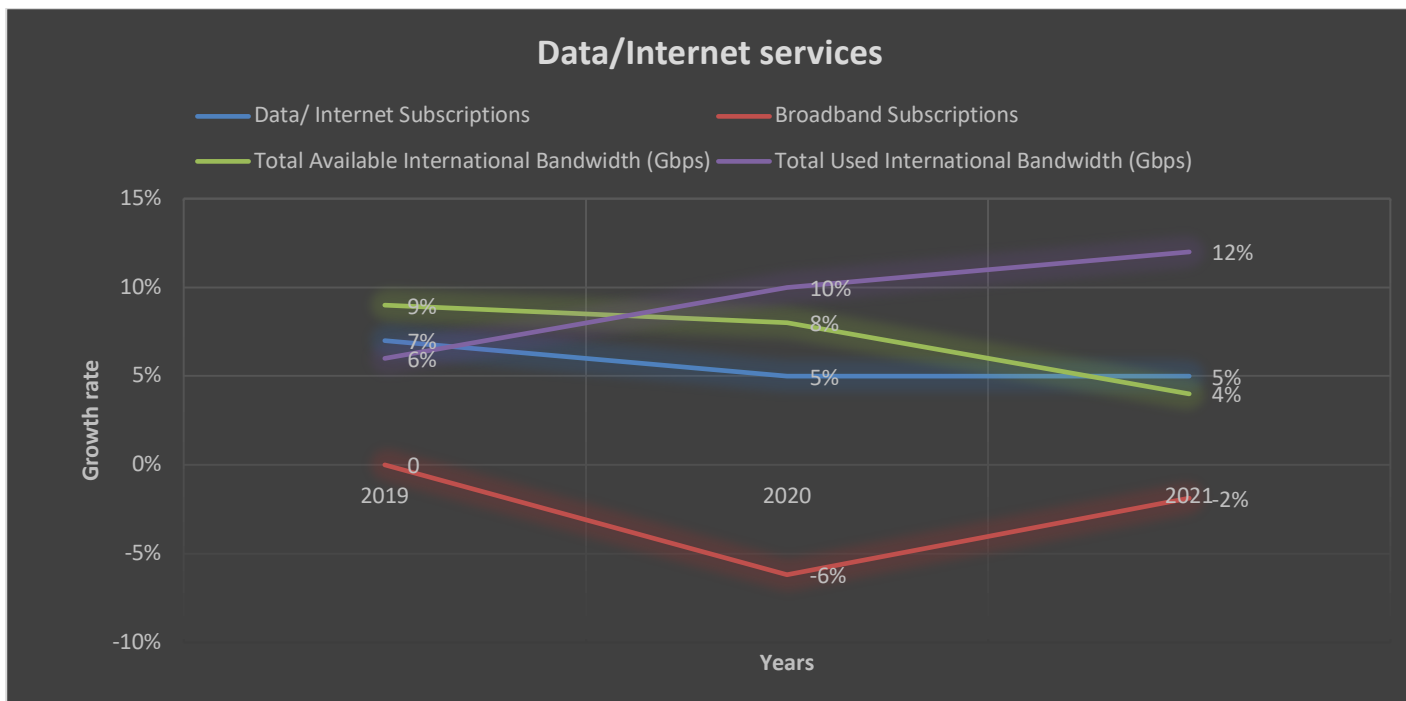


Figure 22: Data/Internet Services
Source: CA Report of 2018/2021

During 2019, 2020 and 2021 all parameters indicated a positive growth except for the broadband subscriptions that recorded a decline in 2020 and a further negative growth in 2021. This implies that a number of broadband subscribers had abandoned their subscriptions in the year 2020 but a few reconnected in 2021. This could be attributed to the closure of many businesses and offices in the major lockdown of 2020, while the resumption in 2021 led to the re-instatement of most of those connections. In contrast, the data/Internet subscriptions continued to grow although at slower pace. However, even with the slower subscription growth rate, the total used international bandwidth recorded rapid growth. The rapid growth between 2019 and 2020 period lies within the COVID-19 major lockdown period where many people were forced to work from home. The sustained growth rate in 2021 could further imply the new normal paradigm which is data/Internet driven.

It is therefore important to note the disparity between the total used international bandwidth growth rate and growth rate of the total available international bandwidth which seems to be growing at a lower rate than the growing demand. Despite the loss of subscribers by communication service providers, the increased steady growth of international bandwidth utilization could imply the creation of some new source of revenue as 'work-from-home' continued to be the new-normal during the COVID-19 pandemic.

4.4.10 Broadcasting services

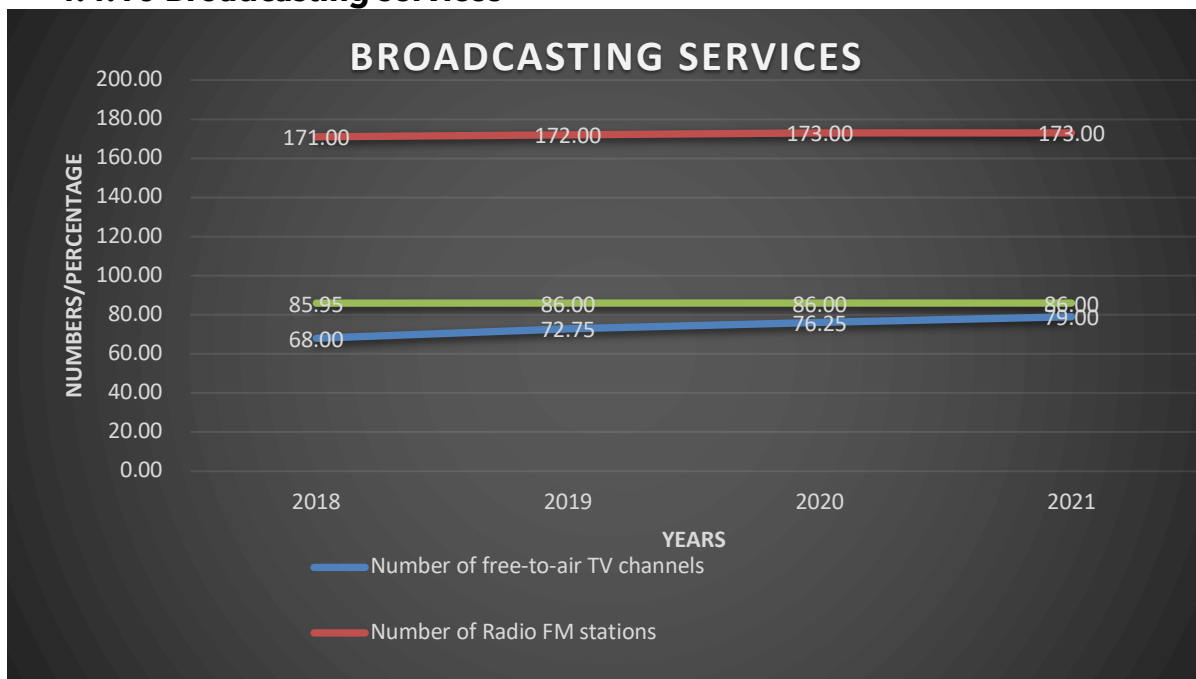


Figure 23: Broadcasting services

Source: CA Report of 2018/2021

During the period 2018 to 2021, the number of free-to-air TV channels has witnessed slight growth. However, the growth in the number of radio FM stations and the number of digital terrestrial television signal have not recorded any significant growth. This points to a possibility that the sector is experiencing some saturation point or is not making a significant appeal to new entrants. In view of emergency response, access to radio and TV would significantly help in distribution of content, especially for the unreached and the underserved, where such stations would be localized to those communities in their local languages and local content.

4.4.11 Postal and Courier Services

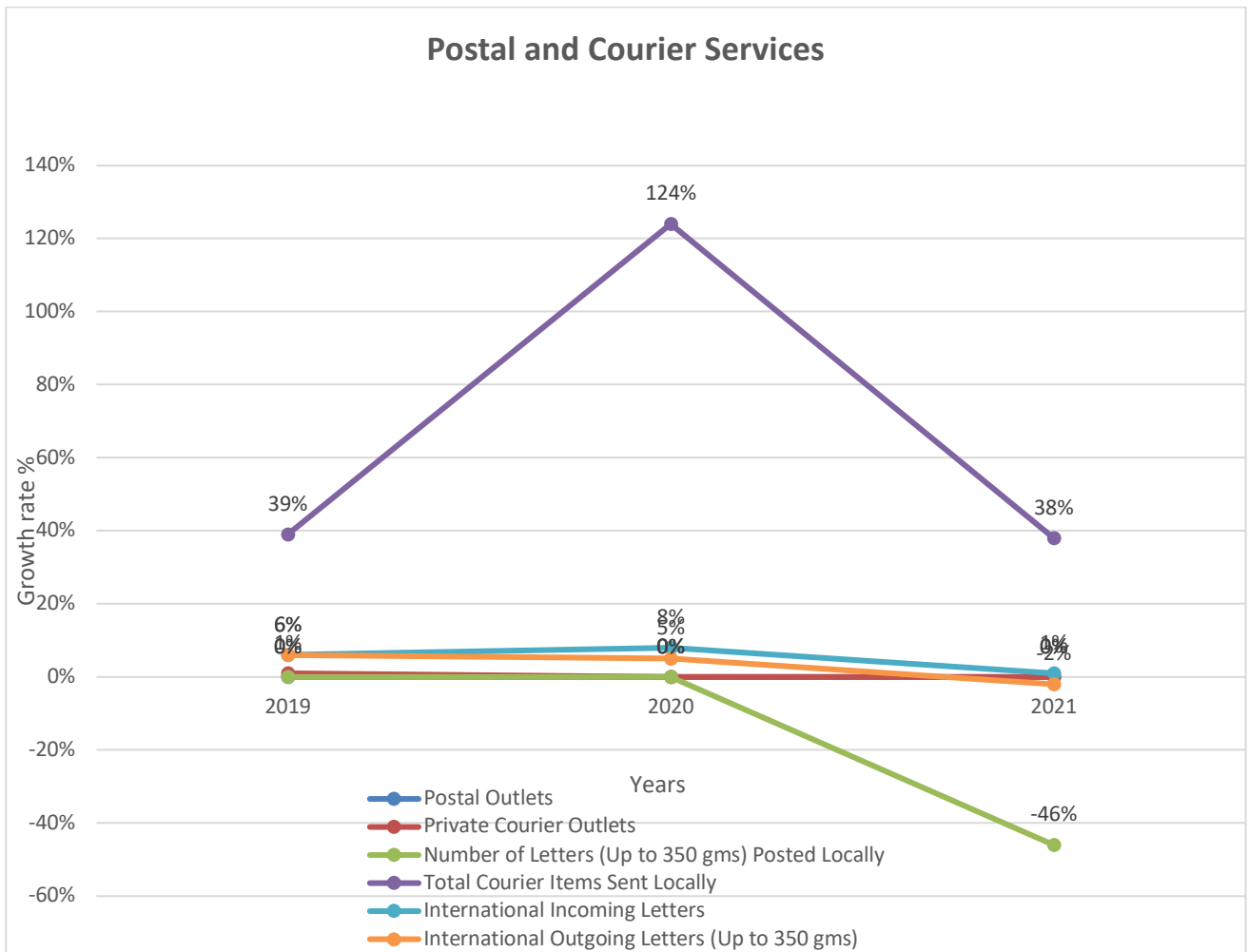


Figure 24: Postal and Courier Services

Source: CA Report of 2018/2021

During the period of 2018 to 2021 in the aspects of postal and courier services, the main observations included a huge spike in the total courier items sent locally in the year 2020 when the country was under major lockdown. Paradoxically, private courier outlets do not show a corresponding rise. This could imply that most of the courier items sent locally were via unregistered private courier outlets. Also notable is that the number of letters posted locally has suffered a huge drop in year 2021. This could imply the new normal where Kenyans have made a migration shift from postal letters to digital technologies. The Postal Corporation of Kenya may have been the largest beneficiary when items were needed to combat the spread of COVID-19 and institutions of preventive measures such as personal protection equipment supplies were shipped around the country to medical institutions. This indicated the critical role that such institutions and businesses could play in ensuring that critical supplies are distributed conveniently to all parts of the country.

4.4.12 Cyber security

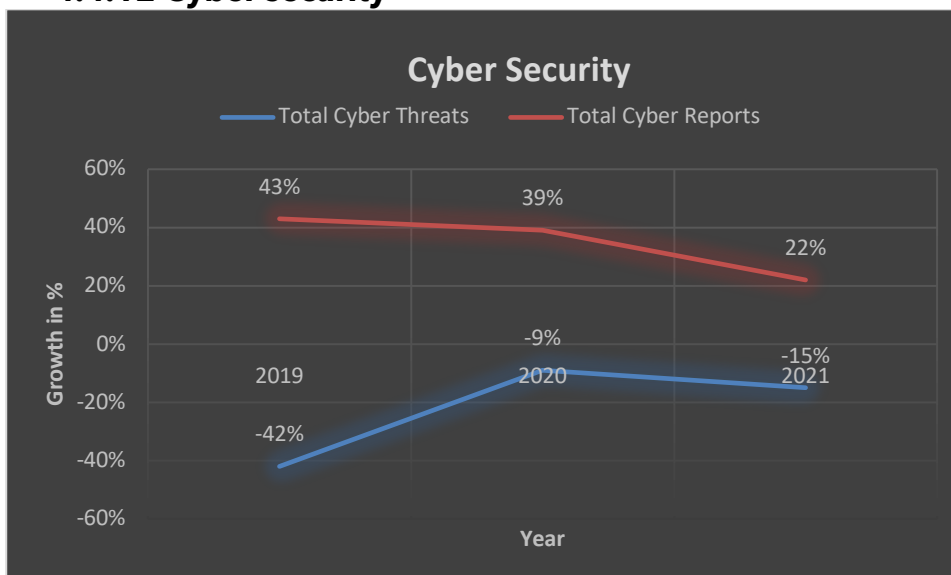


Figure 25: Data/Internet and broadband subscriptions

Source: CA Report of 2018/2021

During the 2019 to 2021 period, reports on cyber threats increased significantly. With the increased cyber threats reporting, actual cyber threats decreased. This is an indication of the efforts put in place to counter cyber threats by the regulator through awareness creation amongst stakeholders of the negative impact of cyber threats. This also implies that key stakeholders in financial and telecommunications sector have invested in cyber threats prevention and response tools, and that these tools have mitigated the growth in cyber threats incidences. In spite of this achievement, the increase of home-users of personal computers in the event of a pandemic might open up a new area of focus for cyber security attention.

4.5 Interventions that were taken for market resilience in Kenya

The researchers conducted a survey using an interview guide on multi-sectoral Government agencies and key private sector institutions that had some critical role in the COVID-19 response interventions. A total of 58 institutions were targeted including the Communications Authority of Kenya, Kenya Revenue Authority, Central Bank, Tourism Regulatory Authority, Ministry of Health and other National Government Ministries, County Governments, Media, Telecommunication Companies, and so forth. Out of the target institutions, 47 were responsive and an online administered interview was conducted. The respondents were asked to explain their roles towards COVID-19 response and the responses are summarized below:

Table 3: Thematic areas of Interventions taken by Kenya in response to COVID-19

Thematic areas	Activities and roles are undertaken by the institutions
Affordability	Ensure variety of services during emergencies to fulfill socio-economic needs
Availability	To help people with specific needs during emergencies, including children, the elderly, and persons with disabilities
Business continuity	Ensuring continuity of business through decision making, planning and implementation, business licenses and permits.
Content Distribution	Information updates and dissemination, dispelling fake news and misinformation
Coordination and administration	Overseeing cooperation and coordination mechanisms at different levels - national, subnational and/or international levels
Emergency Communications	ICT infrastructure support and facilitation, Infrastructure deployment, emergency response, maintaining preparedness
Legal and regulatory, policy	Enforcement of compliance to protocols and lockdown measures, policies interventions, and regulation of communications (tariffs and taxes)
Health response	Vaccination, medical supplies, medical services, safe environment, biowaste disposal, fumigation, WHO protocols guidelines
Risk assessment and monitoring	Data collection and interpretation, and dissemination/update reports
Social support	To help people with specific needs during emergencies, including children, the elderly, and persons with disabilities
Spectrum Policy	Networks and telecommunication/ICT services
Training and sensitization	Sensitization and awareness, continuous training, simulation drills and capacity building, mobilization of public and volunteers

Source: Analysis of research responses using the SMART Model

The findings indicate that the Government of Kenya had an elaborate COVID-19 response framework. Responses in the health thematic area (the primary area) of COVID-19 focused on prevention, detection and treatment. It involved tracking and tracing cases for containment and treatment. The Government rapidly constructed and equipped isolation and treatment wards in the 47 counties' major Government hospitals, as well as national referral hospitals. It marshalled the distribution of Personal Protective Equipment (PPE) for medical staff in all its facilities, and instituted the implementation of all WHO protocols in the entire country. In the thematic area of Legal and regulatory, and policy response, the Government went on to rapidly issue policies and directives for health interventions, social and economic support. It also established administrative systems to enforce the compliance of its directives and policies. Emergency communication structures were established for reporting on incidences and requests for emergency support. The ICT and telecommunications infrastructures were upgraded to cater for the surging telecommunications demands, and money transfer services tariffs were reviewed to waive charges for amounts not exceeding KSH 1,000.00 (USD 10.00). The Central Bank also intervened on easing of financial regulatory controls to enable recovery of

businesses and business continuity. An innovation fund was also activated to encourage innovators and entrepreneurs to develop COVID-19 medical implements, sanitizers, masks, and other support technologies. New technologies and innovations were adopted for the administration of vaccinations, testing and control of movement in and out of the country such as registration of persons entering or leaving the country using technology innovation systems for surveillance, tracking and tracing persons, and distribution of vaccines. Technology and media were adopted to assist in disseminating correct and up-to-date information and dispel fake information circulation. To ensure delivery of essential services and commodities, special travel clearance and identification were provided to these providers. The Government provided intervention on rent control and urged housing owners not to evict their tenants and negotiate payments or lower their rent, whilst the Kenya Revenue Authority provides tax reliefs for affected businesses.

It was also reported that COVID-19 period witnessed escalated gender-based violence, teenage pregnancies and sexual harassment. In response to this matter, the Office of the President instituted wide range of measures administered through the Ministry of Interior and Coordination of National Government. Various development partners also instituted measures for enforcement of sexual harassment and gender-based violence policy. Some toll-free lines for emergency support, and dedicated email addresses, were published in the national media to receive requests on emerging issues including labour related issues, security issues and other distresses. A guideline on occupational safety and health advisory for employees with disabilities was also issued by the Ministry of Labor to ensure that no employee was discriminated or violated against with respect to rights to employment especially when it came to teleworking and medical related absenteeism. A tripartite response team was created to monitor effects of the COVID-19 pandemic on jobs and offer solutions to those effected. Other specific measures included the establishment of the COVID-19 Food Security War Room Hotline, Emergency COVID-19 Response Fund, development of National COVID-19 Nutrition and Healthy Diets Guidelines with a special focus on the most vulnerable communities and groups.

The integral role of nutrition in the fight against the pandemic was also identified and the agri-food supply chain was also addressed to treat agricultural produce transportation as an essential service that is exempt from lockdown with special passes. County Governments crafted guidelines for live animal transporters purchasing animals from markets or seeking movement permits from the Veterinary office to register with County Governments at no charge. In respect to the Ministry of Health, as the cases escalated, the Government started to engage stakeholders to discuss the best ways to manage home-based care isolation and harmonized ways of communicating on the number of infection cases. Training and capacity development measures were carried out with healthcare workers and other front-line staff on COVID-19 response and management; as well as officers attached to the Directorate of Enforcement and Compliance officers to support the County Emergency Response Committee in enforcing Ministry of Health's protocols against COVID-19. Appeals were also made to local and global well-wishers for resource mobilization, and this led to donations of various health equipment, vaccines, food and other goods and financial resources.

Use of online/e-learning strategies for basic education and higher education were also encouraged, as well as assigning of reading and exercises for home study. Various technologies for education were also adopted including the use of radio, podcasts and

television broadcasts of academic content. Different models of teaching emerged including assigning teachers to conduct remote daily or weekly follow-up with students. Upon resumption of physical schools, the beginning and end of the school day were staggered to reduce crowding in schools, school assemblies were cancelled, sports games and other events that create crowded conditions were also suspended. Where possible, the children's desks were kept at least one metre apart and teaching methods were adopted that avoided unnecessary touching. Community Health Workers (CHWs) were also deployed, and equipped with mobile technology through several training on COVID-19 management and control measures. They visited households door-to-door to screen community members for symptoms of COVID-19, and hence isolate, test, and manage suspects of COVID-19.

The Government adopted a vaccination strategy that prioritized its high-risk population and the strategy was escalated gradually to the rest of the population by implementing vaccination centres throughout its 47 counties. Strict enforcement measures were taken against members of the public who were caught flouting the new containment measures. Innovations for communication included updates via social media, websites, radio, TV and, community-level campaigns through local administration. The Government made efforts to facilitate business continuity through technologies such as online businesses and jobs, teleconferencing technology for Government offices, and facilitating working from home. Upon easing of cessation on movement and return to work, the Government provided guidelines for employee protection against COVID-19 and provided advisory on return to work after the pandemic.

The implications of all these interventions taken by the Government and its partners in response to the COVID-19 pandemic were found to have worked to a large extent. The COVID-19 curve was flattened and its speed curbed. Particularly, hand sanitization and hand washing and other WHO protocols have become domesticated and a new normal in many public places even until today. The pandemic also triggered innovations in service delivery models to overcome challenges of travel restrictions. It fostered the need for regional and global cooperation in preparedness and response to future pandemics. Gaps were identified such as the need to educate public on hazardous waste management, the need for robust stakeholder engagement, and the importance of strengthening human and institutional capacity to respond to public health emergencies to cater to every resident of the country. The resumption of learning after the period of school closure came with restructuring of the school calendar and the challenges of completion of course syllabus, but this development also led to innovations on e-learning and other remote learning systems.

The intervention by the Government through focusing on resilient recovery efforts, supporting households, businesses and markets to rebuild and flourish not only significantly contributed to the recovery of the economy but also developed cooperative structures between Government and private partners. On the downside, the pandemic exposed a major disparity between workers who can and cannot telework, and this also was observed between households who could access services from technology and those who could not. The level of enhanced preparedness put in place by the County Governments not only assisted in decreasing cases at the County level but has raised the resilience status of these Counties in case of future pandemics. The COVID-19 interventions also bolstered the capability of most health facilities' infrastructure arising

from key upgrades, with fully equipped standards; and for collection, preparation and storing samples. The vaccination intervention triggered the Government to invest in medical partnerships to establish capacity for the Country to produce its own vaccines in the future.

In a nutshell, it was observed that all the interventions undertaken on COVID-19 were not only collectively significant to the mitigation of the pandemic but also leapfrogged technology adoption and growth of medical infrastructures and other pandemic emergency response systems. Specifically, the WHO protocols and national guidelines such as social distancing, wearing of masks, sanitization, vaccination, working from home, avoiding public areas, and general hygiene stemmed the spread of the disease at the interpersonal level. The National Government's measures and restrictions including lockdown, curfew, quarantines, travel restrictions, closing of schools, workplaces controls, closure of stadiums and sporting facilities, theatres, and number limits in burials, weddings, religious and social gatherings further reduced the escalation of the spread at the national level. Educative measures and sensitization of its citizens and visitors, especially at public facilities in broader issues of protection and response, as well as hazardous waste handling and disposal from the isolation wards to waste handlers, actively prevented further spread of infection through the empowerment of the entire chain of the population to take the right actions for curbing the disease. Allowing the public to resume some social activities, although with limits, created an outlet for the general public to vent out stresses and stemmed mental health issues, abuse and restlessness. The provision of adequate information on vaccinations by the Government helped to guide the public and enhanced the speedy uptake of vaccines.

By adopting remote working and the use of technology for working became a core instrument for business continuity during the pandemic. Further, the reopening of schools went ahead to provide a blueprint of how other institutions could manage their daily activities upon resumption. However, it is uncertain whether the acceptability of the home office as an official business address after COVID-19 pandemic will be a permanent change in the legal existence of a formal business. If this were the case, then there would be need for strengthening home-office Internet connectivity for the businesses of the future.

The vaccination was found effective in preventing serious cases of hospitalization and deaths, thus it has been the first line of defense against the virus. By providing the guidelines for protection of the individual worker has led to the speedy resumption of normalcy in workplace activities. The streamlining of supply chains through carefully crafted policies to ensure the availability of products to citizens ensured security in food supplies and essential commodities. Having well-resourced isolation units, health education and promotion, multi-sectoral response, capacity building of caregivers and resource mobilization helped to overcome the health emergency and to implement rapid economic rescue measures. The latter mostly aimed at providing essential liquidity and protection of livelihoods in the face of abrupt losses in income. As the health crisis gradually abates in the country, attention is now turning to preparing stimulus measures for triggering economic recovery. Mobilization of resources and stakeholder involvement, community outreach by Community Health Volunteers has not only boosted vaccination numbers but has facilitated knowledge dissemination on matters related to COVID-19 such as stigmatization of the infected. Working from home, online and mobile

payment and leveraging technology such as teleconferencing in service delivery with minimized person-to-person contact was said to have contributed to the curtailing of the spread of the disease.

In order to re-open the economy, a number of strategies were undertaken including welcoming foreign investors to invest in the country and explore the country's resources in a marketable way. This was found to have revitalized key sectors such as the tourism sector and hospitality sector. Testing, tracing and tracking of individuals who tested positive for the virus and setting up quarantine centres for them as well as equipping the public health centres, and enhancing cross border surveillance were some of the measures that have been hailed as great contributors to the fight against the spread of the virus.

In regard to the question as to which response actions might have directly helped the country to re-bounce back to its operations, services and economic livelihoods to the highest extent, a majority of the respondents said that *"All of them worked excellently and they all played a part in the country bouncing back to normal operations"*. They singled out the use of technology such as teleconferencing technology as having helped to ensure continuity of services while minimizing face-to-face contact. The role of WHO protocols and the restriction measures including lockdown were also found to have been a great success. One of the respondents argued that *"returning to business will not deliver a sustained long-term economic recovery, instead, massive stimulus packages are starting to be unveiled around the world for Governments, businesses and societies as a whole are necessary to shore-up livelihoods and employment. Not to mention the need to take a step back and reflect on the political and economic driving forces leading to the current crisis."* With reference to Africa, another respondent argued that, *"many African countries may be unable to respond immediately to the crisis. Moreover, the health and economic shocks are likely to quickly put many African countries on an unsustainable debt path."*

4.6 Effects of market resilience responses undertaken in Kenya

In order to assess the effects of the market resilience responses undertaken in Kenya, an interview was conducted with the leadership of national stakeholders' institutions that represent consumers and representatives of communities, societies and associations in the sectors of health, education, agriculture, transport, hospitality, among others. A sample of 46 institutions were purposively selected on the basis of their active role in representing their members during the period of the COVID-19 pandemic. A total of 33 were reachable on call and out of whom 14 organizations accepted the request for an interview and their respondents successfully interviewed. The interview had three items - Description of the interventions by the Government towards COVID-19 that they were aware of in their area of interest; a statement of how the identified interventions affected the respondent's responsibility either positively or negatively; and their general observation of the resilience of the country from the perspective of their area of responsibility.

The organizations mentioned the following interventions by the Government that they could confirm:

Table 4: Interventions by the Government of Kenya that Respondents found effective

Intervention	Descriptions
Administrative	Lockdown, curfew and closing of schools, hotels, religious gatherings and other mass social groupings, and working from home/shifts; controls and ports of entry - including abolishing international air travel; Allowing controlled business services such as limiting the numbers and encouraging take-away for eateries and pubs; Restrictions on public transport and capacity of passengers in commuter vehicles
Economic stimulus	Reduction of Income tax and VAT, tax reliefs, waiver on business licenses, expediting tax refunds, rescheduling of loan repayments and other concessions; Instituted economic recovery policies including tourism recovery policies with low interest loans and prolonged payments, aggressive marketing of tourism as a recovery measure; directive to providers of money transfer service providers and banks to remove mobile money charges for transactions not exceeding Kshs 1,000.00 (USD 10.00).
Health	WHO's protocols such as Wearing of mask, Hand sanitizers and social distancing; Medical supplies including PPE kits, and equipping of health facilities, Construction and equipping of isolation and treatment wards, Emergency response including tracking and tracing for infections, hotlines; vaccination, Quarantine and the isolation rooms in schools, universities, health facilities, ports; and Training and sensitization campaigns.
Information Communication and Technology	Innovations including mobile Apps to enable medical access; working from home; emergency response; to detect, track and trace visitors in ports of entry and cases of infection; real-time reports and updates; debunking fake news and misinformation; e-learning; teleconferencing systems.
Social programmes	Food and nutrition awareness campaign, support for vulnerable families and persons, counselling, and advocacy for rent reduction considerations, special permits with controls for burials and social events, issuance of passes for agricultural produce and other essential supplies

Source: Analysis of research responses using the SMART Model

Disruptions of COVID-19 notwithstanding, the effects of the Government of Kenya's interventions were felt significantly. Issuance of the fresh produce passes allowed resumption of critical trade and a sustainable value chain. This was noted among the horticulture and fresh produce growers. Exporters of cut flowers, fruits and other fresh produce lost a lot of business and had to lay off workers leaving a skeletal number for business continuity. Later, the exporters adopted e-commerce and other innovative forms of sales and deliveries. In the hospitality and entertainment industry, many hotels, restaurants and pubs suffered financial crisis and massive lay-offs, as well. However, with flattening of the infection curve, they resumed business with stringent controls that helped the sector to gradually recover with the workers undergoing testing and vaccination. Although working from home had a huge impact on the public transport

sector, some of them innovated and became courier service providers for parcels and goods between rural and urban centres to meet the gap of the new supply chain. The issue of social distancing and lockdown affected the number of patients seeking treatment at hospitals. This called for medical services innovations including use of mobile Apps and other technology tools to enable access, emergency response and controlled the numbers of visitors to the hospital facilities at a time.

The recovery interventions in the tourism sector were very useful. A new Marketing Kenya campaign as a post COVID-19 tourism destination led to steady return of tourists and the recovery of the tourism sector. The tax reliefs were also very useful to the tourism businesses. Moreover, the volume of online content on tourist sites increased and there is now higher quality information - *"You can see that on social media, where nowadays people post new discoveries of tourism places not known before, for instance, Ololokwe Mountain in the little explored Northern Kenya. In the past, if you searched for that mountain, you only got a picture or two, but right now it's really opened up and has become like a new destination."* Further, Kenya's tourism drive dubbed the Magical Kenya has urged counties to register their tourist attractions, and thus, this opened up the country with new tourist destinations. The real estate sector was extremely affected by massive layoffs, tenancy and financing. Schools especially private ones lost revenue and learners had difficulties completing the syllabus even after resumption of classes. Hospitality industry became more creative including the introduction of online marketing and trading. The work from home was found to have triggered fresh innovations in teleconferencing as a new normal of telecommuting. Delivery of education continued by adopting various technologies and innovations including radio, television, teleconferencing tools and other e-learning tools.

The vaccination campaign rapidly helped the country to resume its economic activities, and eased lockdown and travel restrictions, with evidence of the flattening the infection curve and severe disease. The interventions by the Central Bank on credit and financial costs were critical to loan access and lowering the cost of capital. Moratorium on loan repayments eased credit defaults and helped to leverage business financing. Policies and rules instituted for resilience in the education sector made livelihoods safer and are likely to remain for a long time. There is also a paradigm shift in signing of contracts and official documents, for instance recognizing the use of electronic signatures as a mode of execution of documents in Kenya, even in real estate. Prior to the pandemic, the use of digital signatures was not widespread. The resulting wide acceptability of digital signatures is helping businesses to do business with each other without the need for physical meetings for signing of documents. There is a proliferation of home office online service businesses that are disrupting the formally registered businesses and are threatening to destroy the established businesses such as in the area of tourism and other sectors. The Government's establishment of emergency funds to help cushion the businesses during the crisis greatly supported the recovery of businesses especially in tours and travels - which is a major economic activity of Kenya. However, many businesses continue to need grants to address the pending costs of the COVID-19 period when they were not open. The health sector has also benefited from improved infrastructure and better equipping, and this would assist their preparedness for the unknown future resilience and robustness.

Many businesses embraced technology and innovation in their operations, especially in the use of social media communication and marketing, courier services for delivery of goods and parcels, and are urging their members to make use of technology. Backward and forward supply linkages increased as businesses tried to avert supply chain disruptions. Market diversification is gaining significant traction, where previously export biased businesses are also considering regional and local markets. Product diversification by mixing of product and service lines was identified in the flower and horticulture sector with some also embracing farming of other crops as well to mitigate market risks. In general, the measures that the Government undertook to respond to the COVID-19 pandemic in Kenya did indeed put the country on the pathway to recovery.

The market resilience of Kenya when COVID-19 struck—according to the analysis in Table 3 on a level of 1 to 5, where 1=Starting, 2=Moderate, 3=Advanced, 4=Robust and 5=verTerbrate—was at the level of Moderate (2). The poor rating of the Subnational Government was very conspicuous. Based on the interview on the effects of the Government’s interventions towards COVID-19, a majority of the respondents indicated significant improvement in the preparedness for the COVID-19 pandemic and other similar pandemics both at the National and the County levels. They cited the adoption of technology and innovations for business continuity, construction and equipping of hospitals, the establishment of governance structures for emergencies, allocation of significant resources to emergency preparedness, and improved level of cooperation between National, Subnational and Regional/Global actors, as well public cooperation in emergency response. Based on this argument, there are compelling observations to indicate that the market resilience of Kenya has improved from initial reported moderate level at the beginning of the pandemic at least to Advanced. Moreover, the observations were able to indicate that the country has adopted resiliency measures and prepared itself better for future pandemics. The wide adoption of technologies and innovations during the pandemic have opened new and robust frontiers towards furtherance of digital advancement. Digital business models have also gained huge momentum in all areas and for this, the telecommunication sector will continue to play a significant and pivotal role for sustainable development. The implications are a post-COVID-19 study might be required to trace the real impact of the intervention and responses to the areas of Leadership and Governance; Preparedness; Infrastructure and Resources; Cooperation at local, national and regional/global levels.

5. DISCUSSIONS

The study intended to achieve four objectives - (1) To determine the market resilience maturity status in Kenya during the COVID-19 phenomenon; (2) To report on the market changes experienced in Kenya during the COVID-19 phenomenon; (3) To determine the interventions that were taken for market resilience in Kenya during the COVID-19 phenomenon; and (4) To evaluate the effects of the market resilience responses undertaken in Kenya during the COVID-19 phenomenon.

The market resilience maturity status in Kenya during the COVID-19 phenomenon was observed as Moderate on a scale of 1 to 5, where 1=Starting, 2=Moderate, 3=Advanced, 4=Robust and 5=verTebrate. This status was not satisfactory because it was below average. The weakest point of resilience was the capacity of the subnational Governments which score moderate on 50% of the items evaluated. More critical was below average resilience status on “How developed the action plan for managing disasters and

emergencies resilience was. Evidence required was the existence of annual work plans, data collection and analysis of requirements, indicators of performance, M&E framework, emergency communication systems". These were lacking in most of the County Governments. However, with the implementation of COVID-19 response interventions majority of the Counties have reported the establishment of the necessary action plans for COVID-19 and other future pandemic.

In regard to market changes experienced in Kenya during COVID-19, the findings indicated a surge in infrastructure utilization in broadband Internet and mobile Internet. The Fixed Line Internet was also found to be incapable of responding to user demands in case of a lock down. Increased volume of home working practice could simply need enhancement of connectivity for home network for emergency use during lockdowns. The determination of what interventions were taken by Kenya towards the COVID-19 found that the Government had a well-structured approach with a wide range of interventions which seem to have worked to restore resumption of normal operations quickly. The effects of these interventions had impactful outcomes that in deed assisted the county to recover speedily. In overall, Information Communication and Telecommunication technology has become greatly embraced as a continuity means in the event of pandemic disruptions. This implies that Governments such as Kenya must continue to invest in a better capacity for achieving better Emergency Communications, Affordability, Availability, effective Spectrum Policy and Content Distribution during a pandemic such as COVID-19.

6. CONCLUSIONS AND RECOMMENDATIONS

The research has shown that Kenya's market resilience was Moderate during the COVID-19 pandemic and that the various socio-economic response measures taken were highly dependent on ICT and digital technologies. The Kenyan Government, and the society as a whole, learned valuable lessons from the pandemic. They instituted and adopted policies, procedures, and social norms to mitigate the pandemic and some of these are now being adopted as a new norm for the post-pandemic society. It was also observed that many experts still believe that the chance of having pandemic of similar devastations as COVID-19 will happen. In this regard, it will be critical for Kenya and other countries to institute effective pandemic mitigation measures based on the lessons learned from this pandemic to increase the resilience of their countries.

The study recommends that Kenya and other emerging economies should expand their ICT infrastructures including broadband connectivity, use of AI for public health surveillance, and smart devices penetration. It further recommends the strengthening of logistic and value-chains, institutional mechanism, policy implementation oversighting, and advocacy activities at all levels of the society. Specifically, there should be creation of more permanent coordination mechanism to ensure effective use of ICT and digital technologies during disasters; and creating of effective mitigation and contingency plans for future calamities, including rapid social safeguards as was seen in the reduction of mobile money transaction fees in Kenya. The raft of policies and strategies that emerged during the pandemic will need synthesizing for curation of the best practices into national, regional, and global policies as strategies to prepare for the next pandemic.

Other specific recommendations include the following: the need for the country to formulate its National Emergency Telecommunication Plan; and implementation of a

national reporting framework that highlights market resilience status and the findings and lessons learned should be adapted by the different Government departments, private sector, and civil society institutions. The Communication Authority's reporting template should include Total Number of Unique subscribers for visibility of Access Coverage on the served and unserved population. In view of efficient allocation and use of spectrums, the freed spectrums should be usefully utilized to support interventions such as emergency use and social support recovery measures. Further, Government mitigation plans for the impact of future pandemics should provide contingency plans not only for domestic business continuity but also for international business continuity to ensure further market resilience. Industry stakeholders and start-ups should also be encouraged to create innovative products and services that could cater to the post-pandemic norms and prepare for the next pandemic. It will also be important for businesses that rely on fixed networks to provide redundant network connectivity for their critical employees so as to continue to perform their tasks with same effectiveness and productivity during disasters. Additionally, the regulator should implore operators to be ready to provide alternative quality connectivity for VoIP services countrywide to ensure universal access to critical Internet infrastructure in case of pandemics' disruptions. Operators should be encouraged towards SMS interoperability and low SMS termination rates to ease emergency communication. Negotiation for better International SMS termination rates and as well as advancing greater use of Over The Top Services (OTTS) like 'WhatsApp' to provide alternatives to expensive International SMS deserves urgent consideration. Having seen the great role of mobile money during the pandemic, operators should be encouraged to lower transaction costs so as to encourage the population to sustain the use of cash-less payments for business transactions. Investors in appropriate ICT infrastructures, such as community radio stations and other rural communities' communication services should be encouraged for they not only provide an avenue for increasing access to information but could also provide valuable communication during emergency situations. Besides, the Government should modernize the national postal service provider's infrastructure, systems and assist it to embrace e-commerce to leverage on its national presence. The licensing and compliance of private courier operators will need to be closely supervised since they will form a critical means for emergency response in pandemics. More consumer awareness needs to protect end-users, especially children and their care givers from cyber threats, will be important as a means to cater for the growing reliance on ICT and associated services. Moreover, more cyber security response and surveillance capacity should be increased, including setup of regional computer emergency response teams and computer incident reporting teams.

In addition to the policy related recommendations, another market resilience research with a refined research methodology should be undertaken in other countries to better understand the regional and global perspective of market resilience as well as to monitor the global preparedness. Annual exercise of this type of for Kenya will be required to monitor the progress of disaster preparedness and strengthening of a sustainable market resilience.

REFERENCES

- A, Gupta PK, Srivastava A. (2020). A review of modern technologies for tackling COVID-19 pandemic. *Diabetes Metab Syndr Clin Res Rev.* 2020;14: 569-73
- Adams-Prassl, A., Boneva, T., Golin, M., & Rauh, C. (2020). Inequality in the impact of the coronavirus shock: Evidence from real time surveys. *Journal of Public Economics*, 189, 104245. <https://doi.org/10.1016/j.jpubeco.2020.104245>
- Alaimo, L. S., Fiore, M., & Galati, A. (2020). How the COVID-19 Pandemic Is Changing
- Atsuko, O., & Karazhantva, A. (2020). Digital resilience against COVID-19.
- Baig, A., Hall, B., Jenkins, P., Lamarre, E., McCarthy, B. (2020). The COVID-19 recovery will be digital: a plan for the first 90 days. McKinsey Digital. Retrieved from <https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/theCOVID-19-recovery-will-be-digital-a-plan-for-the-first-90-days?cid=other-eml-alt-mbl-mck&hlkid=c10f8eca65f749e288443f04fbcffc5f&hctky=1529367&hdpid=dfb4c609-2604-4df3-aa>.
- Bangkok: United nation ESCAP. <https://www.unescap.org/blog/digital-resilience-against-COVID-19#>
- Boh, W., Constantinides, P., Padmanabhan, B., Viswanathan, S., Henfridsson, O., Rai, A., & Sen, S. (2021). Digital Resilience During COVID19: Fleeting or Enduring.
- Bukht, Rumana and Heeks, Richard, Defining, Conceptualising and Measuring the Digital Economy (August 3, 2017). Development Informatics Working Paper no. 68, <https://ssrn.com/abstract=3431732> or <http://dx.doi.org/10.2139/ssrn.3431732>
- Check Point Research (2021). Check Point's 2021 Cyber Security Report Reveals Extent of Global Cyber Pandemic, and Shows How Organizations Can Develop Immunity. <https://pages.checkpoint.com/cyber-security-report-2021.html>
- Cochran, William G. (1977). *Sampling Techniques* (Third ed.). Wiley. ISBN 0-471-16240-X.
- Communications Authority (2018). First quarter sector statistics report for the financial year 2018/2019 (July-September 2018). <https://www.ca.go.ke/wp-content/uploads/2018/12/Sector-Statistics-Report-Q1-2018-2019.pdf>
- Communications Authority (2018). Fourth quarter sector statistics report for the financial year 2017/2018 (April-June 2018)
- Communications Authority (2018). Second quarter sector statistics report for the financial year 2018/2019(October - December 2018). <https://www.ca.go.ke/wp-content/uploads/2019/03/Sector-Statistics-Report-Q2-2018-19.pdf>
- Communications Authority (2018). Third quarter sector statistics report for the financial year 2017/2018 (1st January - 31st March 2018)
- Communications Authority (2019). First quarter sector statistics report for the financial year 2019/2020 (July - September 2019) <https://www.ca.go.ke/wp-content/uploads/2019/12/Sector-Statistics-Report-Q1-2019-2020.pdf>
- Communications Authority (2019). Second quarter sector statistics report for the financial year 2019/2020 (October-December 2019) <https://www.ca.go.ke/wp-content/uploads/2020/03/Sector-Statistics-Report-Q2-2019-2020-1.pdf>

- Communications Authority (2019). Third quarter sector statistics report for the financial year 2018/2019 (January - March 2019) <https://www.ca.go.ke/wp-content/uploads/2019/06/Sector-Statistics-Report-Q3-2018-19.pdf>
- Communications Authority (2020). First quarter sector statistics report for the financial year 2020/2021 (July - September 2020) <https://www.ca.go.ke/wp-content/uploads/2020/12/Sector-Statistics-Report-Q1-2020-2021.pdf>
- Communications Authority (2020). Fourth quarter sector statistics report for the financial year 2019/20 (April-June 2020) <https://www.ca.go.ke/wp-content/uploads/2020/10/Sector-Statistics-Report-Q4-2019-2020.pdf>
- Communications Authority (2020). Second quarter sector statistics report for the financial year 2020/2021 (October-December 2020) <https://www.ca.go.ke/wp-content/uploads/2021/03/Sector-Statistics-Report-Q2-2020-2021-1.pdf>
- Communications Authority (2020). Third quarter sector statistics report for the financial year 2019/2020 (January - March 2020) <https://www.ca.go.ke/wp-content/uploads/2020/07/Sector-Statistics-Report-Q3-2019-2020-.pdf>
- Communications Authority (2021). First quarter sector statistics report for the financial year 2021/2022 (July - September 2021). Retrieved <https://www.ca.go.ke/wp-content/uploads/2021/12/Sector-Statistics-Report-Q1-2021-2022.pdf>
- Communications Authority (2021). Fourth quarter sector statistics report for the financial year 2020/21 (April- June 2021) <https://www.ca.go.ke/wp-content/uploads/2021/09/Sector-Statistics-Report-Q4-2020-2021.pdf>
- Communications Authority (2021). Third quarter sector statistics report for the financial year 2020/2021 (January-March 2021) <https://www.ca.go.ke/wp-content/uploads/2021/06/Sector-Statistics-Report-Q3-2020-2021.pdf>
- Communications Authority (2021, May). Licensing-and-Shared-Spectrum-Framework-for-Community-Networks-May-2021.docx.pdf. <https://www.ca.go.ke/wp-content/uploads/2021/05/Licensing-and-Shared-Spectrum-Framework-for-Community-Networks-May-2021.docx.pdf>
- Communications Authority, 2020 Increased investments push growth in ICT sector to catalyze Big 4 Agenda, report shows. <https://ca.go.ke/increased-investments-push-growth-in-ict-sector-to-catalyze-big-4-agenda-report-shows> (Accessed 26 December 2020)
- Dahlman, C., Mealy, S., & Wermelinger, M. (2016). Harnessing the digital economy for developing countries. Department of Broadband, Communications and the Digital Economy. (2009). Australia's Digital Economy: Future Directions.
- Downing, J., Field, M., Sebstad, J., & Ripley, M. (2018). Market Systems Resilience: A Framework for Measurement. *Ecosystems*, 4(5), 390-405. <https://doi.org/10.1007/s10021-001-0101-5>
- EAP-CSF (2020). SMEs Digital Transformation in the Eastern Partnership (EAP) Countries in COVID-19 Time: Challenges and Digital Solutions. <https://eap-csf.eu/wp-content/uploads/SMEs-digital-transformation-in-the-EaP-countries-during-COVID-19.pdf>
- Elmasry, T. et al., 2016. Digital Middle East: Transforming the Region into a Leading Digital Economy, McKinsey & Company, New York, NY.
- Enormous. (2020). The India lockdown study: Understand the change in attitudes, motivations, and behavior of the young Indian consuming class. www.enormous.be

- European Commission. (2020). COVID-19 impacts and short-term economic recovery in Kenya. <https://publications.jrc.ec.europa.eu/repository/handle/JRC121284#:~:text=Te%20GDP%20would%20see%20a,imposed%20in%20Kenya%20as%20well>
- Floetgen, R., Strauss, J., Weking, J., Hein, A., Urmetzer, F., Böhm, M., & Krcmar, H. (2021). Introducing platform ecosystem resilience: Leveraging mobility platforms and their ecosystems for the new normal during COVID-19. *European Journal of Information Systems*, 30, 304-321. <https://doi.org/10.1080/0960085X.2021.1884009>
- G20 DETF (2016). G20 Digital Economy Development and Cooperation Initiative, G20 Digital Economy Task Force. <http://www.g20.utoronto.ca/2016/g20-digital-economy-development-andcooperation.pdf>
- Garnett, P. (2021, March 15). Building resilience for future pandemics. https://www.itu.int/net4/ITU-D/CDS/InteractiveProgramme/MeetSpeakers_Presentations/index.asp?MeetingCode=C2R
- Gaspar, V., Collin, P., Devereux, M. P., Jim, H. S., Varrak, T., Walsh, M., & Westberg, B. (2014). Commission expert group on taxation of the digital economy. European Commission, May 2014.
- Gathuru, G, Mwenyeri, M (2021). The Impact of COVID-19 on Education in Kenya <https://ieakenya.or.ke/blog/the-impact-of-COVID-19-on-education-in-kenya/>
- GSMA (2020). Connected Society. The State of Mobile Internet Connectivity 2020. Retrieved on Aug 17, 2021 from <https://www.gsma.com/r/wp-content/uploads/2020/09/GSMA-State-of-Mobile-Internet-Connectivity-Report-2020.pdf>
- Holling, C. S. (2001). Understanding the Complexity of Economic, Ecological, and Social Systems. *Ecosystems*, 4(5), 390-405. <https://doi.org/10.1007/s10021-001-0101-5>
- <http://www.mckinsey.com/global-themes/middle-eastand-africa/digital-middle-east-transforming-the-region-into-a-leading-digital-economy>.
- https://pathwayscommission.bsg.ox.ac.uk/sites/default/files/2021-01/COVID-19_and_disruption_of_the_digital_economy_28jan21.pdf
- <https://www.ca.go.ke/wp-content/uploads/2018/07/Sector-Statistics-Report-Q3-2017-18-2.pdf>
- <https://www.ca.go.ke/wp-content/uploads/2018/10/Quarter-Four-sector-statistics-report-for-the-Financial-Year-2017-18.pdf>
- Huang, X., Kujipers, D., Li, L., Sha, S., & Xia, C. (2020). How Chinese consumers are changing shopping habits in response to COVID-19. Retrieved from <https://www.mckinsey.com/~media/McKinsey/Featured%20Insights/Asia%20Pacific/How%20Chinese%20consumers%20are%20changing%20shopping%20habits%20in%20response%20to%20COVID%2019/HowChinese-consumers-are-changing-shopping-habits-in-response-to-COVID-19-v3.pdf>
- ICTA (2019). Digital Economy Blueprint Powering Kenya's Transformation. ICTA Authority, "Digital Economy Blueprint". ICTA: Nairobi
- IOM UN Migration. (2021). EHoA COVID-19 Strategic Response and Recovery Plan 2021_0.pdf. https://reliefweb.int/sites/reliefweb.int/files/resources/EHoA%20COVID-19%20Strategic%20Response%20and%20Recovery%20Plan%202021_0.pdf

- ITU (2019). ICT Centric Innovation Ecosystem. Kenya: Country Review. Thematic Reports - Innovation. Geneva: ITU Publications.
- ITU (2020). Economic Impact of COVID-19 on Digital Infrastructure Report of an Economic Experts Roundtable organized by IT
- ITU (2020). Economic Impact of COVID-19 on Digital Infrastructure Report of an Economic Experts Roundtable organized by IT. https://www.itu.int/dms_pub/itu-d/opb/pref/D-PREF-EF.COV_ECO_IMPACT-2020-PDF-E.pdf
- ITU (2020). ITU guidelines for national emergency telecommunication plans; Thematic reports. International Telecommunication Union (ITU), Tech. Rep.
- ITU (2020a). Global Cybersecurity Index, 2020. Geneva: ITU Publications.
- ITU (2020b). Economic Impact of COVID-19 on digital infrastructure. International Telecommunication Union report, Report of an Economic Experts Roundtable organized by ITU. <https://www.itu.int/en/ITU-D/Regulatory-Market/Pages/Events2020/EconomicRoundTable/home.aspx>
- ITU (2021). Connect2Recover initiative: A methodology for identifying connectivity gaps and strengthening resilience in the new normal <https://www.itu.int/hub/publication/d-tnd-04-2021/#:~:text=The%20Connect2Recover%20initiative%20supports%20countries,of%20the%20COVID%2D19%20pandemic>
- ITU (2021). Measuring digital development Facts and Figures 2021 International Telecommunication Union Development Sector. <https://www.itu.int/itu-d/reports/statistics/facts-figures-2021/>
- ITU (2021a). The impact of policies, regulation, and institutions on ICT sector performance. Geneva: ITU Publications.
- ITU (2021b). Connect2Recover: Building back better with broadband. Building Resilience for Future Pandemics. Retrieved on Aug 23, 2021 from <https://connect2recover.itu.int/>
- ITU (2021c). A methodology for identifying gaps and strengthening resilience in the new normal. Retrieved on Aug 23, 2021 from <https://www.itu.int/hub/publication/d-tnd-04-2021/>
- Kane, G. C., Philips, A. N., Copulsky, J. R., & Andrus, G. R. (2019). The technology fallacy: How people are the real key to digital transformation. Cambridge: The MIT Press.
- Kaplan, J., Frias, L., Mcfall-Johnsen, M. (2020, July 11). A third of the global population is on coronavirus lockdown: Here's our constantly updated list of countries and restrictions. <https://www.businessinsider.in/international/news/a-third-of-the-global-population-is-on-coronavirus-lockdown-x2014-hereaposs-our-constantly-updated-list-of-countries-and-restrictions/slidelist/75208623.cms>
- Karishma, B et al: COVID-19 and disruption of the digital economy; evidence from low and middle-income countries
- KNBS. (2020b). Leading Economic Indicators April 2020. Nairobi. Retrieved from <https://www.knbs.or.ke/?wpdmpro=leading-economic-indicators-april-2020>
- KNBS. (2021). Economic Survey 2021. <https://www.knbs.or.ke/wp-content/uploads/2021/09/Economic-Survey-2021.pdf>
- Koslowski, T. G., Longstaff, P.H., Vidal, M. & Grob, T. (2012). Resilience analysis of the ICT ecosystem. Calgary: International Telecommunications Society (ITS).
- Laato, S., Islam, A. N., Farooq, A., & Dhir, A. (2020). Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach. *Journal of Retailing and Consumer Services*, 57(1).

- Lane, N., 1999. Advancing the digital economy into the 21st century, *Information Systems Frontiers*, 1(3), 317-320.
- Manyika, J. et al., 2013. *Lions Go Digital: The Internet's Transformative Potential in Africa*, McKinsey Global Institute, New York, NY.
<http://www.mckinsey.com/industries/high-tech/ourinsights/lions-go-digital-the-internets-transformative-potential-in-africa>
- MasterCard, 2021: 79% of Kenyan Consumers are Shopping More Online Since the Start of Pandemic, Reveals MasterCard Study.
<https://newsroom.mastercard.com/mea/press-releases/79-of-kenyan-consumers-are-shopping-more-online-since-the-start-of-pandemic-reveals-mastercard-study/>
- Mesenbourg, T.L., 2001. *Measuring the Digital Economy*, US Bureau of the Census, Suitland, MD. <https://www.census.gov/content/dam/Census/library/workingpapers/2001/econ/umdigital.pdf>
- MIT Technology Review. (2020). MIT COVID tracing tracker. <https://www.technologyreview.com/>
- MoH (2020). First case of Coronavirus Disease confirmed in Kenya
<https://www.health.go.ke/first-case-of-coronavirus-disease-confirmed-in-kenya/#:~:text=Port%20Health%20Services-,FIRST%20CASE%20OF%20CORONAVIRUS%20DISEASE%20CONFIRMED%20IN%20KENYA,in%20China%20in%20December%202019>
- MolCT (2020). Ministry of Information, Communication, Technology, Innovation and Youth Affairs Digital Economy Strategy. <https://ict.go.ke/wp-content/uploads/2020/08/10th-july-final-copy-digital-economy-strategy-draft-one.pdf>
- Nicola, M., Alsafi, Z., Sohrabi, C., Keerwan, A., Al-Jabir, A., Iosifidis, C., et al. (2020). The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery*, 78, 185-193.
- Nulty, D. D. (2008). The adequacy of response rates to online and paper surveys: what can be done?. *Assessment & evaluation in higher education*, 33(3), 301-314
- OECD (2020), *Digital Transformation in the Age of COVID-19 : Building Resilience and Bridging Divides*, Digital Economy Outlook 2020 Supplement, Paris: OECD.
- OECD (2020), *Digital Transformation in the Age of COVID-19 : Building Resilience and Bridging Divides*, Digital Economy Outlook 2020 Supplement, Paris: OECD.
- OECD, (2020). *Fostering Economic Resilience in a World of Open and Integrated Markets: Risks, Vulnerabilities and Areas for Policy Action*
- OECD, (2020). *Fostering Economic Resilience in a World of Open and Integrated Markets: Risks, Vulnerabilities and Areas for Policy Action*
- Online Food Shopping Human Behaviour in Italy. *Sustainability*, 12(22), 1-18
- Owusu, P. (2020). Digital technology applications for contact tracing: the new promise for COVID-19 and beyond? *Global Health Research and Policy*.
<https://ghrp.biomedcentral.com/track/pdf/10.1186/s41256-020-00164-1.pdf>
- Park, I., Sharman, R., & Rao, H. R. (2015). Disaster Experience and Hospital Information Systems: An Examination of Perceived Information Assurance, Risk, Resilience, and HIS Usefulness. *MIS Quarterly*, 39(2), 317-344.
<https://doi.org/10.25300/MISQ/2015/39.2.03>
- Priest, J., Carter, S., & Statt, D. A. (2013). People as Consumers. In *Consumer Behavior* (Vol. 1, pp. 1-11). Edinburgh: Edinburgh Business School-Heriot-Watt University.

- PRNewswire. (2020). The Telecommunications Industry in Kenya 2019: Growth in the Digital Economy, Mobile Telephony & Internet Penetration <https://www.prnewswire.com/news-releases/the-telecommunications-industry-in-kenya-2019-growth-in-the-digital-economy-mobile-telephony--internet-penetration-300990299.html#:~:text=The%20Kenyan%20government%20identified%20the,and%20cybersecurity%20markets%20in%20particular>
- Quaife, M., van Zandvoort, K., Gimma, A., Shah, K., McCreesh, N., Prem, K., Barasa, E., Mwanga, D., Kangwana, B., Pinchoff, J., Bosse, N. I., Medley, G., O'Reilly, K., Leclerc, Q. J., Jit, M., Lowe, R., Davies, N. G., Deol, A. K., Knight, G. M., ... CMMID COVID-19 Working Group. (2020). The impact of COVID-19 control measures on social contacts and transmission in Kenyan informal settlements. *BMC Medicine*, 18(1), 316. <https://doi.org/10.1186/s12916-020-01779-4>
- Rose, A. (2004). Defining and Measuring Economic Resilience to Disasters. *Disaster Prevention and Management*, 13, 307-314. <https://doi.org/10.1108/09653560410556528>
- Standard (2020). How COVID-19 pandemic has affected the healthcare system in Kenya <https://www.standardmedia.co.ke/health/article/2001369644/how-COVID-19-pandemic-has-affected-the-healthcare-system-in-Kenya>
- Tabitha, K., N. (2021). Impact of COVID-19 Measures on Kenya's Education Sector. AERC Working Paper - COVID-19 _011 https://aercafrica.org/wp-content/uploads/2021/10/AERC-Working-Paper-COVID-19_011.pdf
- Tamale, C.N. and Gathii, J.T. (2021). Snapshot of Kenya's external debt over the last decade. <https://www.afronomicslaw.org/category/african-sovereign-debt-justice-network-afsdjn/snapshot-kenyas-external-debt>
- Tapscott, D., 1996. *The Digital Economy: Promise and Peril in the Age of Networked Intelligence*, McGraw-Hill, New York, NY.
- Tourism Policy Responses to the coronavirus (COVID-19). (n.d.). Retrieved 28 February 2022, from <https://www.oecd.org/coronavirus/policy-responses/tourism-policy-responses-to-the-coronavirus-COVID-19 -6466aa20/>
- UN (2020). A UN framework for the immediate socio-economic response to COVID-19 . Retrieved on Aug 20, 2021 from <https://unsdg.un.org/sites/default/files/2020-04/UN-framework-for-the-immediate-socio-economic-response-to-COVID-19.pdf>
- UNCTAD (2019). *Digital Economy Report, 2019. Value Creation and Capture: An Implication for Developing Countries*. New York: United Nations Publications.
- UNCTAD (2020). *Impact of the COVID-19 Pandemic on Trade and Development. Transforming to a New Normal*. New York: United Nations Publications.
- UNCTAD, 2021: *Impacts of the COVID-19 pandemic on trade in the digital economy - UNCTAD Technical Notes on ICT for Development No. 19* https://unctad.org/system/files/official-document/tn_unctad_ict4d19_en.pdf
- UNDG (2017) *Theory of Change - UNDAF Companion Guidance*, UNDG. Retrieved from: <https://unsdg.un.org/resources/theory-change-undaf-companion-guidance>.
- USAID (2019). *Market Systems Resilience. A Framework for Measurement*. Retrieved on Aug 23, 2021 from https://www.usaid.gov/sites/default/files/documents/1866/Market-Systems-Resilience-Measurement-Framework-Report-Final_public-August-2019.pdf

- Vaishya R, Javaid M, Khan IH, Haleem A. (2020). Artificial intelligence (AI) applications for COVID-19 pandemic. <https://doi.org/10.1016/j.dsx.2020.04.012>. 8. Kumar
- Wangari, E. N., Gichuki, P., Abuor, A. A., Wambui, J., Okeyo, S. O., Oyatsi, H. T. N., Odikara, S., & Kulohoma, B. W. (2021). Kenya's response to the COVID-19 pandemic: A balance between minimising morbidity and adverse economic impact. *AAS Open Research*, 4, 3. <https://doi.org/10.12688/aasopenres.13156.2>
- WEF (2020). The COVID-19 pandemic has changed education forever. This is how <https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/>
- WEF, 2015. Expanding Participation and Boosting Growth: The Infrastructure Needs of the Digital Economy, World Economic Forum, Geneva www3.weforum.org/docs/WEFUSA_DigitalInfrastructure_Report2015.pdf,
- Weinhardt, C., Peukert, C., Hinz, O., & van der Aalst, W. M. P. (2021). Welcome to Economies in IS!: On the Plethora of IT-Enabled Economies. *Business & Information Systems Engineering*, 63(4), 325-328. <https://doi.org/10.1007/s12599-021-00705-z>
- WHO (2020). WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020 (retrieved from <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>)
- WHO. (2020). Contact tracing. <https://www.who.int/news-room/q-a-detail/contact-tracing>
- WHO. (2020). WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020. <https://www.who.int/director-general/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020>
- World Bank (2019). Kenya's Digital Economy Assessment Summary Report. Washington, DC: The World Bank Group.
- World Bank (2020) What COVID-19 Means for Digital Infrastructure in Emerging Markets. <https://openknowledge.worldbank.org/bitstream/handle/10986/34306/What-COVID-19-Means-for-Digital-Infrastructure-in-Emerging-Markets.pdf?sequence=1&isAllowed=y>
- World Bank. 2020a. Kenya COVID-19 emergency response project (P173820). <http://documents.worldbank.org/>.

Appendices

Appendix 1: List of organizations where the Questionnaire was administered

- 1 Consumer Unit Trust Sacco (CUTS)
- 2 Consumer Downtown association(CDA)
- 3 Healthcare Consumers Federation of Kenya (HCFK)
- 4 Kenya Consumer Organization (KCO)
- 5 Consumer Financial Protection Bureau (CFPB)
- 6 African Organisation for Standardisation - ARSO
- 7 Kenya Association Of Tour Operators
- 8 Kenya Medical Association(KMA)
- 9 KENYA ASSOCIATION FOR THE INTELLECTUALLY HANDICAPPED
- 10 Consumer Federation of Kenya (COFEK)
- 11 Consumer International Network (CIN)
- 12 Insurance Consumers Federation of Kenya (ICFK)
- 13 Association of Insurance Consumers of Kenya (AICK)
- 14 Information Communication Technology Consumers Association of Kenya
- 15 Kenya Association of Residents Association (KARA)
- 17 Kenya Tea Growers Association
- 18 Kenya Private Sector Alliance
- 19 Kenya International Freight and Warehousing Association
- 20 Kenya National Chamber of Commerce & Industry
- 21 Kenya Flower Council
- 22 Kenya Association of Manufacturers
- 23 Fresh Produce Exporters Association of Kenya
- 24 Ecotourism Association of Kenya
- 25 East African Tea Trade Association
- 26 Association for Participation in Development
- 27 Kenya Professional Safari Guides Association
- 28 The Pubs Entertainment and Restaurants Association of Kenya
- 29 Associations of Mombasa & Coast Tourism
- 30 Kenya Driving School Association
- 31 Kenya Water and Sanitation Civil Societies Network (KEWASNET)
- 32 Kenya Security Industry Association (KSIA)
- 33 Protective and Safety Association of Kenya
- 34 Kenya Professional Realtors Association (KPRA)
- 35 Kenya Property Developers Association
- 36 Kenya Publishers Association
- 37 Petroleum Outlets Association of Kenya
- 38 CommunityForests Associations (CFA)
- 39 Tourism Financial Corporation (TFC)
- 40 Tourism Regulatory Authority (TRA)
- 41 COFEK
- 42 TESPOK
- 43 CIAK
- 44 BOAK
- 45 KEPSA
- 46 Matatu association

Appendix 2: Questionnaire that was administered -please review it and complete

Market resilience questionnaire

Market resilience ensures a dynamic Digital Economy by simulating competition and innovation. It focuses on the ability of the market to self-regulate and provide affordable prices to end-users by maintaining a diverse and competitive market. The COVID-19 phenomenon has exacerbated the human dependency on digital infrastructures.

Worldwide, different Governments have taken mixed responses including emergency communication, service affordability and availability, spectrum policy, and strategic content distribution. This is a study funded by International Telecommunication Union (ITU) to assess market resilience in emerging digital economies, a case study of Kenya during the COVID-19 pandemic. You are kindly requested to assist complete this study by responding to this questionnaire. Your responses will be treated with confidentiality and the data collected will be used for the stated purpose only.

1. Indicate your sector or institution

2. How was the country's leadership and governance towards disasters and emergencies (i.e. Did it at least have a mandated multi-sectoral agency or coordinating department for this)? Tick one per row.

Mark only one oval per row.

	Insignificant Robust	Moderate	Advanced	Robust	Very
At national level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At devolved governments units	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At regional and global representation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. How was the state of legislation for managing disasters and emergencies resilience in the country (i.e. Existence of laws, policies, guidelines, certification and enforcement of conformity, monitoring and reporting etc.)? Tick one per row.

Mark only one oval per row.

	Insignificant	Moderate	Advanced	Robust	Very Robust
At the national level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At devolved government units	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At regional and global representation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. What was the extent of learning and knowledge dissemination for managing disasters and emergencies resilience in the country (i.e. Existence of training programmes, use of innovations such as artificial intelligence, big data, best practice code, critical mass of trained experts, formal evaluation of preparedness, drills, etc.)? Tick one per row.

Mark only one oval per row.

	Insignificant	Moderate	Advanced	Robust	Very Robust
At the national level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At devolved government units	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At regional and global representation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. How developed was the action plan for managing disasters and emergencies resilience in the country (i.e. Existence of annual work plans, data collection and analysis of requirements, indicators of performance, M&E framework, emergency communication systems, etc.) Tick one per row

Mark only one oval per row.

	Insignificant	Moderate	Advanced	Robust	Very Robust
At the national level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At devolved government units	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At regional and global representation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. What was the country's state of preparedness for disasters and emergencies for resilience (i.e. Did it have the risks management systems, updated risk registers, risk response plans, contingencies for service affordability and availability for poor and vulnerable, etc.) Tick one per row

Mark only one oval per row.

	Insignificant	Moderate	Advanced	Robust	Very Robust
At the national level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At devolved government units	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At regional and global representation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. How was the adequacy of manpower development in disasters and emergencies for resilience (i.e. Continuous development of teams including volunteers, experts, multi-stakeholder such as public and private companies and communities, etc.)? Tick one per row

Mark only one oval per row.

	Insignificant	Moderate	Advanced	Robust	Very Robust
At the national level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At devolved government units	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At regional and global representation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. How was the nature of development of critical infrastructures to handle disasters and emergencies for resilience (i.e. Health, security, redundant communication networks, essential service delivery units, rapid evacuation exit routes - that apply to your sector; for instance ICT sector include spectrum policy and strategic content distribution for emergencies.)? Tick one per row

Mark only one oval per row.

	Insignificant	Moderate	Advanced	Robust	Very Robust
At the national level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At devolved government units	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At regional and global representation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. How adequate were the resources set aside to cater for disasters and emergencies for resilience (i.e. Budget, Human Resources, Equipment and machinery, physical, logistical, insurance, resilience innovations, etc.)? Tick one per row

Mark only one oval per row.

	Insignificant	Moderate	Advanced	Robust	Very Robust
At the national level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At devolved government units	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At regional and global representation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. What was the nature and quality of partnerships that the country had to cover disasters and emergencies for resilience (i.e. Mapping of service providers, cooperation with stakeholder engaged and well-coordinated, information sharing etc.) Tick one per row.

Mark only one oval per row.

	Insignificant	Moderate	Advanced	Robust	Very Robust
At the national level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At devolved government units	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At regional and global representation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. How much were the disasters and emergencies alliances (i.e Formal alliances relevant institution, interdependent departments, consumers associations, specialized service providers, etc.)? Tick on per row.

Mark only one oval per row.

	Insignificant	Moderate	Advanced	Robust	Very Robust
At the national level	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At devolved government units	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
At regional and global representation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

12. Briefly describe your role in responding to the COVID-19 pandemic?

13. List the interventions that you have undertaken in response to the COVID-19 pandemic. (Number them and include the targets and achievements)

14. In your assessment to what extent have your interventions worked?

15. In your assessment, which of your response actions might have directly helped the country to re-bounce back to its operations, services and economic livelihoods at the highest extent?

Thank you.

Appendix 3: List of organizations where the interview was administered (Consumer groups and other stakeholders)

National Government (Ministries)

1. Ministry of Interior and Co-ordination of National Government
2. Ministry of Defence
3. The National Treasury and Planning
4. Ministry of Foreign Affairs
5. Ministry of Industry, Trade & Co-operatives
6. Ministry of Health
7. Ministry of Agriculture, Livestock, Fisheries and Irrigation
8. Ministry of Transport, Infrastructure, Housing, Urban Development and Public Works
9. Ministry of Devolution and the ASALS
10. Ministry of Information, Communication and Technology (ICT)
11. Ministry of Sports, Culture and Heritage
12. Ministry of Education
13. Ministry of East African Community (EAC) and Regional Development
14. Ministry of Labour and Social Protection
15. Ministry of Tourism and Wildlife
16. Ministry of Environment and Forestry
17. Ministry of Water and Sanitation
18. Ministry of Lands and Physical Planning
19. Ministry of Energy
20. Ministry of Petroleum and Mining
21. Ministry of Public Service, Youth and Gender

Counties (subnational government)

22. Mombasa
23. Kwale
24. Kilifi
25. Tana River
26. Lamu
27. Taita/Taveta
28. Garissa
29. Wajir
30. Mandera
31. Marsabit
32. Isiolo
33. Meru
34. Tharaka-Nithi
35. Embu
36. Kitui
37. Machakos
38. Makueni
39. Nyandarua
40. Nyeri
41. Kirinyaga

42. Murang'a
43. Kiambu
44. Turkana
45. West Pokot
46. Samburu
47. Trans Nzoia
48. Uasin Gishu
49. Elgeyo/Marakwet
50. Nandi
51. Baringo
52. Laikipia
53. Nakuru
54. Narok
55. Kajiado
56. Kericho
57. Bomet
58. Kakamega
59. Vihiga
60. Bungoma
61. Busia
62. Siaya
63. Kisumu
64. Homa Bay
65. Migori
66. Kisii
67. Nyamira
68. Nairobi City

Appendix 4: Interview guide

Interview Guide on impact of the interventions

1. Name of the organization: _____
2. Kindly describe the interventions by Government towards COVID-19 that you are aware of in your area of interest:
3. State how each of the interventions you have mentioned affected your area of responsibility either positively or negatively:
4. What is your general observation on the resilience of the country in your area of responsibility following the COVID-19 pandemic and the interventions that Government undertook?

