MOBILE TELECOMMUNICATIONS TECHNOLOGY CHANGE AND THE CONTRIBUTIONS IN SUB-SAHARA AFRICA: A COMPARATIVE CASE STUDY OF KENYA AND GHANA

Research Paper Presented by

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(KENYA)

In partial fulfillment of the requirements for obtaining the degree of

MASTER OF ARTS IN DEVELOPMENT STUDIES

Major:
Economics of Development (ECD)

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November 2018
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<tr>
<th>Acronym</th>
<th>Full Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>GoK</td>
<td>Government of Kenya</td>
</tr>
<tr>
<td>MNO</td>
<td>Mobile Network Operator</td>
</tr>
<tr>
<td>FDI</td>
<td>Foreign Direct Investments</td>
</tr>
<tr>
<td>ISP</td>
<td>Internet Service Providers</td>
</tr>
<tr>
<td>WHO</td>
<td>African Health Observatory</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>AHO</td>
<td>Africa Health Observatory</td>
</tr>
<tr>
<td>CAK</td>
<td>Communications Authority of Kenya</td>
</tr>
<tr>
<td>IEG</td>
<td>Independent Evaluation Group</td>
</tr>
<tr>
<td>UNCTAD</td>
<td>United Nations Conference on Trade and Development</td>
</tr>
<tr>
<td>ISDN</td>
<td>Integrated Services Digital Network</td>
</tr>
<tr>
<td>CCK</td>
<td>Commission Communications of Kenya</td>
</tr>
<tr>
<td>CAK</td>
<td>Communications Authority of Kenya</td>
</tr>
<tr>
<td>NGO</td>
<td>Non-Government Organization</td>
</tr>
<tr>
<td>ICT</td>
<td>Information Communication Technology</td>
</tr>
<tr>
<td>MPC</td>
<td>Monopolies and Prices Commission</td>
</tr>
<tr>
<td>OECD</td>
<td>Organization for Economic Development and Co-operation</td>
</tr>
<tr>
<td>ICC</td>
<td>International Chamber of Commerce</td>
</tr>
<tr>
<td>CAoK</td>
<td>Competition Authority of Kenya</td>
</tr>
<tr>
<td>GSMA</td>
<td>Groupe Spéciale Mobile Association</td>
</tr>
<tr>
<td>GoG</td>
<td>Government of Ghana</td>
</tr>
<tr>
<td>ITU</td>
<td>International Telecommunications Union</td>
</tr>
<tr>
<td>USF</td>
<td>Universal Service Fund</td>
</tr>
<tr>
<td>FDI</td>
<td>Foreign Direct Investment</td>
</tr>
<tr>
<td>GIFEC</td>
<td>Ghana Investment Fund for Electronic Communication</td>
</tr>
<tr>
<td>GP&amp;T</td>
<td>Ghana Post and Telecommunications</td>
</tr>
<tr>
<td>RTMPC</td>
<td>Restrictive Trade Policies, Monopolies and Price Control Act</td>
</tr>
<tr>
<td>NISL</td>
<td>Netcom Informations System Ltd</td>
</tr>
<tr>
<td>MICT</td>
<td>Ministry of Information, Technology and Communication</td>
</tr>
<tr>
<td>NCA</td>
<td>National Communication Authority (Ghana).</td>
</tr>
<tr>
<td>TFS</td>
<td>The Fletcher School</td>
</tr>
<tr>
<td>EPZ</td>
<td>Export Processing Zones Kenya</td>
</tr>
</tbody>
</table>
Acknowledgement

I would like to firstly appreciate and be thankful to God for His unending favors, for this opportunity to study for my Masters.

Secondly, I am thankful to my Family for their unwavering pillar of Love and strength; my deceased dad James for his believe in each one of us, my mum Pauline, my sister Tabitha, my brother Michael and Simon for setting an example to push forward no matter the challenges. My 2-year-old nephew Willem for making the hard times easy to get by. Your support has enabled me to achieve significant academic milestones. I have profound gratitude for your continuous support, encouragement and constructive academic engagements.

Thirdly, I would like to thank my supervisor and second reader Prof. Dr. Peter A.G. van Bergeijk and Dr. Howard Nicholas for their support during this process.

Finally, my special mention goes to Noah and Zilper for their critical insight and encouragement. To the Cannatas, thank you for allowing me to use your study room despite the teacup rings I left on the furniture. Your support and understanding during this process is appreciated.
Abstract

This research paper examines how institutional and technological change in mobile telecommunications has contributed to economic growth in Sub-Sahara Africa. This study draws attention to the liberalization and reregulation process and how telecommunications infrastructure has developed and contributed to the progress in the region. The study uses a comparative case study regarding Ghana and Kenya to investigate how these structural changes and reforms of policies and institutions influenced the performance of the industry in these respective countries. This paper uses two main variables to investigate telecommunications teledensity: mobile cellular subscriptions per 100 people and individuals using the internet in percent of population. The variation of these variables over time demonstrates how different policy concerns and implementation strategies contributed to the long-run success of the industry in the Ghana and Kenya. This study also investigates why Ghana performed better than Kenya in telecommunications. The study emphasizes the importance of institutions, technology change and strong competitive structures for a thriving sector. The findings of this study indicate that Ghana’s performance is attributed to a fast liberalization process and implementation mechanism tied with different strategies and institutional frameworks that encompassed increasing rural cellular density compared to Kenya.
Relevance to Development Studies

Technology evolution in mobile telecommunications is important for economic growth. Telecommunications infrastructure has improved the access of telecommunication services in the rural areas. The expansion of the infrastructure improves access to information, reduces transaction costs between farmers and buyers and improves access to health information through mobile applications. Mobile telecommunications have revolutionized the access to educational materials in rural areas through mobile phone applications. Platforms such as e-learning are improving the access to information in the rural areas in Kenya. The development of mobile applications for modern mobile devices enabled financial inclusivity using mobile money services and improving access to information. “Policy makers, newspapers, and mobile phone companies have all touted the poverty-eradicating potential of mobile phones” (Aker and Mbiti 2010: 208). These developments are attributed evolution of the telecommunications industry which led to the increased access to mobile phones and internet use in Sub-Saharan Africa.

Studies in Kenya indicate that the penetration of Internet and mobile technology services improved access to health care services such as health information, telemedicine and eLearning under the umbrella ‘mHealth’ which “manages mobile technology projects in the health sector” (mHealth 2018). The industry contributes to the development of innovative services that provide alternative solutions. Technology change in telecommunications has contributed to improve the standards of living. Mobile penetration in the rural areas have increased inclusivity in services such as mobile financing which are now available without requiring a bank account. The ease of use and low costs of transmission through wireless technologies has increased literacy levels in the rural areas.

Key Words: Mobile Telecommunications, Telecommunications Infrastructure, Telecommunications Liberalization, Kenya, Ghana, Technology Change, De-Regulation.
Chapter 1. Introduction

1.1. Background

Since the early 1990’s, the telecommunications industry has experienced significant changes. These changes evolved from fixed telephony with limited use such as voice calls to more modern mobile technologies expanding use and functionality such as text messaging, android services, and mobile apps such as mobile banking (Aker and Mbiti 2010: 220). During this period, state monopolies operated the industries which were also characterized by poor quality of products and services. Because of this, structural changes of reforms in the industry began in the developed countries (Starr 1990).

These changes triggered the reform process towards competitiveness, liberalization, infrastructure innovation and institutional reforms which lead to the establishment of independent regulators. During this time industry reforms began to take place in Europe whereby countries like The Netherlands and United Kingdom introduced structural changes in the telecommunications industry among them eliminating monopolies and competitiveness (Kloosterhuis and Bergeijk 2005: 67).

The process to these structural changes underwent years of challenges to reform and adopt the changes. The delay to de-regulate was severed for a long time because the reforms were viewed as a mechanism for control as a form of a ‘capitalist order’. The structural changes were contested by ‘radicals and Marxists’ who argued that a “capitalist society required increased state intervention to control their internal contradictions” (Starr 1990). In Ghana, telecom reforms were developed after the state-owned monopoly GP&T was considered inefficient in terms of service delivery (Haggarty et al. 2003: 4).

The monopoly of industry establishes “Low labour productivity, deteriorating fixed facilities and equipment, poor service quality, chronic revenue shortage and inadequate investment” (Kessides 2004: 2). There are emerging concerns that network monopolies manipulate the processes and industry results to public resources waste. Therefore, the state-owned entities had to be ‘reversed or undone’ to encourage privatization and competition (Starr 1990).

From the elimination of monopolies to a decade of implementing structural changes of policies and institutions, the changes were continual into the 2000’s (Kessides 2004: 2-7). Between 1990 and 2000 privatization and competition were realized by the entry of new firms. In Ghana, the entry of new competitors occurred during the ADP-2000 structural reforms of Ghana Post and Telecommunications (GP&T) to allow a second operator in 1993 (Ebo 2010: 1). In Kenya, full liberalization was realized after the Economic Reforms of 1998 were implemented allowing new entrants and competition in 2000. Nevertheless, internet connection in Kenya was available until 1992 by email services only through Internet Service Providers (ISP) (Netcom Informations System Ltd (NISL) 2012: 34; Otieno and Aligula 2006: ii). The paradigm shift in Sub-
Sahara Africa was particularly important in the 1990’s to align the telecommunications industry to a path of development (Aker and Mbiti 2010: 208).

As new entrants emerged, so did mobile technology change occur thus increasing competitiveness and innovation of the industry. To maintain competitiveness telecommunication firms adopted innovation through a process of ‘Creative Destruction’ and in the process, ensuring the sustainability of operators (Laino 2011: 2). The need to meet the changing mobile technology led to the innovation of differentiated products and services, which led to exponential growth of the industry with a myriad of mobile technological capabilities. This increased mobile coverage in sub-Saharan Africa (SSA) by 60% as of 2007, and more mobile technology variations possibilities. The evolution of mobile telecommunications has transformed how service delivery occurs to “transform the lives through innovative applications” (Aker and Mbiti 2010: 208).

In Sub-Saharan Africa, de-regulation of the industry was inevitable given the number of state-owned monopolies and bureaucratic interferences hindering industry evolution. To experience industry growth, monopolies are eliminated and adaptation to the changing telecommunications environment is embraced. This leads to the liberalization of industry which allows new entrants to transform the network with new ideas, technology and strategies for growth and diversification of industry (Lal and Strachan 2004: 14).

1.2. Statement of the Problem

Since 1990, Ghana and Kenya have undergone significant telecommunications structural changes in reforms of policies and institutions. Both countries were influenced to initiate the reforms by the global shifts to make the industry more de-regulated and privatized. Due to this, Sub-Saharan Africa underwent changes at the same time as the rest of the world. (Haggarty et al. 2003: 7; Gachagua 2004: 3).

Ghana and Kenya underwent the same periods of structural changes. The need to undertake structural changes in reforms of policies and institutions to eliminate monopolies and implement better policies that allow competition began soon after the global shifts towards de-regulation and privatization (Kloosterhuis and Bergeijk 2005: 67). These structural shifts were the beginning of the continual process to liberalize the respective telecommunications industry. Nevertheless, both countries were implementing and prioritizing different policies and implementation mechanisms. This influenced the transformation of the telecommunications industry which experienced poor telecommunication density between 1990 and 2000. Despite a poor density, Ghana was performing better than Kenya. Ghana experienced rapid growth in the density of mobile cellular per (100) population and Internet use per cent population after 2000. Kenya also experienced growth but not as rapid as Ghana which has a mobile penetration rate of 68% as of 2017 (GSMA 2017).
1.3. **Purpose of the Study**

The purpose of the study is to analyze how technology change in mobile telecommunications transformed the industry and the factors that enabled these transformations to occur. The study will address the significance of the industry to transform the livelihood of the people and how this contributed to economic growth. The comparative analysis provides recommendations for action by the government and stakeholders such as Competition authority of Kenya. This research will provide recommendations at the end as possible insights for the growth of the telecommunications industry in Kenya.

Based on previous studies, Braathen (2004: 32-34) conducted an empirical analysis of the telecommunications industry in Mozambique and Zimbabwe. The study focuses on institutional capabilities such as ‘power and trust and how they influence institutional performance. Moreover, the study contains two main variables of discussion i.e. professionalism and neo-patrimonial. The former addresses characterization and the latter discusses how personalization of institutions influence institutional performance (Braathen 2004: 32-34). Therefore, these research papers use a ‘Tracing’ comparative approach to examine how communications technology change contributes to development. Bennet (2004: 23) documents that tracing in comparative case studies enables the researcher to identify “similar patterns or sequences in different cases” (Bennet 2004: 23). This study allows to trace how structural changes of policies and institutions contributed to overperformance in Ghana, and why not in Kenya. The findings of this research will be crucial towards improving Kenya’s performance.

1.4. **Research Question**

The research focuses on how the institutions and market structure of the telecommunications industry evolved and the contributions to development. Given the above background the research will address the following questions:

1.4.1. **Main Research Question**

1. **Under Which Conditions Can the Communication Sector Contribute to Positive Development?**

This question will address under what conditions did the communications industry evolve. Based on the literature, the study identifies the main variables to analyse these conditions. Telecommunications liberalization improved the performance of the industry, which resulted in new entrants and competition. Thereafter, increased investments in telecommunication infrastructure improved teledensity. The process of telecommunication change is continual due to changing technological environment.
1.4.2. Sub-Questions

2. **Is the Mobile Industry Important for Economic Development?**
   This question is important to track how technology change in the telecommunications industry contributed to economic development at the macro-level and improving livelihoods at the micro-level.

3. **How Can the Mobile Industry Be Stimulated by the Government?**
   This question demonstrates the role of institutions towards de-regulation and reregulation. The institutions are an integral part of the telecommunication liberalization and improved performance of the industry.

4. **Why Did Ghana Perform Better Than Kenya?**
   This is a comparative case study. Its relevance demonstrates how different approaches to structural changes of reforms in policies and institutions contributed to the rapid performance of Ghana’s telecommunications industry.

1.5. **Research Objectives**

This research is an extensive analysis of the technological changes and trends experienced in the telecommunication industry in Ghana and Kenya: The objectives are:

1. To understand why Ghana’s telecommunications industry performed better.
2. To assess the reason behind Ghana’s performance.
3. To provide recommendations to the Government of Kenya.

1.6. **Methodology**

The research paper examines the structural changes in policies and institutions that transformed the telecommunications industry performance and innovation. The study will place context in practicality by identifying two case studies in SSA i.e. Kenya and Ghana. The two countries are to a large extent comparable given that they have similar timelines during which deregulation and re-regulation of industry occurred. However, the data analysis from the respective telecommunications industries indicates interesting differences in the patterns of telecommunication density growth and innovation.

The research method was designed based on the research objectives of this study. The study develops a theoretical framework that will be a useful tool for understanding how mobile technology change results to industry performance and the sequences of technology change in the industry. This research is based on literature by Damsgaard and Gao 2007 and World Bank 2018. The identified variables formulated the data selected for this analysis in two ways. First,
to analyse which factors enabled mobile technology change to occur between 1990 – 2000 and after 2000. Second, the analysis illustrates the factors that influenced sector performance in Sub-Sahara, case study Kenya and Ghana.

1.7. Data Inputs

The telecommunications infrastructure density is examined using world bank development indicators as ‘mobile cellular subscription per 100 people and Individuals using internet per cent population (World Bank 2018). Below presents the summary statistics of the data collected between 1995-2016 to understand how the data is distributed. Mobile cellular subscription in Ghana had a higher standard deviation compared to Kenya at 48 and 31 respectively. A descriptive statistics table is important to illustrate how the data was dispersed (Statistics Solutions n.d.) see table 1. While measuring the technology change in telecommunications, I analyzed data between 1994-1999 and between 2000-2016. The observed trends during the de-regulation and privatization were of great significance. Key written materials from newspapers, NGOs, blogs and academia were identified.

Credible sources such as the World Bank, articles, UNCTAD, GSMA, blogs, newspapers, OECD and ITU provided credible secondary data for analysis and validation of the theoretical framework. The collected data comes from 1990 (i.e. when the paradigm shift of the telecommunications industry was undergoing structural changes) and up to 2016 to demonstrate the current trends.

Case study data was collected from existing literature, journals, blogs and newspapers. This data was used to develop a comparative analysis to establish the trends of growth in mobile telecommunications and which policies and reforms were implicated in the process. Deloitte and GSMA (2012: 89) conducted an analysis in SSA on how a 10% increase in mobile penetration would impact GDP in selected SSA countries. The result depicted that Kenya had 1.7 while Ghana followed with a 1.4 increase respectively (Deloitte and GSMA 2012: 89). This similarity in timelines to structural changes, de-regulation and new entrants make Ghana and Kenya ideal for a comparative case study.
Table 1. Data and Summary Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Observation</th>
<th>Std. Dev</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile cellular subscriptions (100 people)</td>
<td>22</td>
<td>48.376</td>
<td>0.0369</td>
<td>135.801</td>
<td>42.5727</td>
</tr>
<tr>
<td>Ghana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individuals using the internet (% population</td>
<td>22</td>
<td>10.4371</td>
<td>0.0</td>
<td>34.666</td>
<td>7.190</td>
</tr>
<tr>
<td>Ghana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP growth (annual %)</td>
<td>22</td>
<td>2.456</td>
<td>3.7</td>
<td>14.047</td>
<td>5.785</td>
</tr>
<tr>
<td>Ghana</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mobile cellular subscriptions (100 people)</td>
<td>22</td>
<td>31.8471</td>
<td>0.008</td>
<td>80.439</td>
<td>39.516</td>
</tr>
<tr>
<td>Kenya</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individuals using the internet (% population</td>
<td>22</td>
<td>5.7929</td>
<td>0.008</td>
<td>16.6</td>
<td>5.448</td>
</tr>
<tr>
<td>Kenya</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GDP growth (annual %)</td>
<td>22</td>
<td>2.2595</td>
<td>0.2322</td>
<td>8.405</td>
<td>3.921</td>
</tr>
<tr>
<td>Kenya</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: World Bank 2018

1.8. Choice of Case-Study

The case study is an excellent method to examine how a similar past is an interconnection for future implications with different outcomes (Goodrick 2014: 1). Ghana and Kenya depict similar past of structural changes of policies and reforms to de-regulate, re-regulate and privatize the telecommunications sector from 1990’s. However, both countries different outcomes as from 2000, where Ghana performed better than Kenya. Therefore, this research applies a comparative case-study to conduct the analysis. The importance of this approach is to examine how similar periods of structural changes and reforms had different outcomes in teledensity in the long run. In comparative case-studies, it is important to assess “why particular programmes or policies fail to work” (Goodrick 2014: 1).

The telecommunications industry competitiveness has often been evaluated using M. Porters Theory of Competitive Advantage. Nonetheless, the theory is limited to expound on how technology change in telecommunications contributes to economic growth and improving livelihoods. In addition, the institutional context formulating policies and implementing policies is inadequately addressed by M. Porter who focuses on the threat of new entrants, substitute
of products, Bargaining power of buyers, bargaining power of suppliers and competitive rivalry (Porter 1990). In addition, another limitation is that while conducting a comparative case study analysis, thus using a theory is contradictory. Therefore, the researcher must initiate a ‘tracing’ approach to identify “how some situations and events influence others” (Bartlett and Vavrus 2017: 10).

1.8.1. Kenya

Kenya’s performance in the telecommunications industry has been exemplary since fully liberalizing in 1999. By 2000, the industry was motivated by new entrants who established a competitive niche for innovation, this increased technological barriers to entry. In Africa, Kenya is among the top 5 innovators in mobile applications and start-up technology (CapitalFM 2018). Kenya is an interesting case study due to innovations in mobile telecommunications such as M-pesa, mHealth and e-Learning (AHO 2018; BBC 2018 ICT-Authority n.d.). In East Africa, Kenya mobile telecommunications penetration is the highest at 57%, Rwanda at 52% (GSMA 2017). The research findings and recommendations can be shared with stakeholders in Kenya given that the researcher is Kenyan.

1.8.2. Ghana

The telecommunications industry in Ghana is a significant driver for economic growth. The industry underwent structural reforms between 1990 and 1995 and an implementation period from 1995 to 2000. Ghana is particularly an interesting case study because structural changes in the industry began at the same time as Kenya in the 1990’s. By 1999, Ghana had 3 private network operators and the teledensity increasing rapidly faster than Kenya. Teledensity has increased from 0.36 in 1995 to 0.81% in 1999, whereas mobile cellular subscribers per 100 persons increased from 0.04 to 0.36 in 1995 and 1999 respectively (Nayo 2001). As of 2011, Ghana had one of the highest mobile phone penetration rate in Africa with 73% (Deloitte and GSMA 2011).

1.9. Ethical Considerations

Ethical considerations are an important factor in every research process. While conducting the comparative case study, trends and patterns indicated different results which deviating slightly from the research question. Therefore, to accurately analyse these research question, I addressed the issue by rethinking of an appropriate research question to address emerging trends. This contributed to developing an appropriate research question that properly investigated the research problem.
1.10. Limitations of The Study.

While conducting the research, the main limitation experienced was about identifying an appropriate theoretical framework that addresses the research question and research objectives in a holistic manner. On the other hand, it is difficult to assess exact reasons why Ghana performed better than Kenya in mobile teledensity. In order to present an accurate analysis, qualitative research entails reviewing a considerable amount of literature which can be time consuming.

1.11. Organization of The Paper

The organization of this research paper is illustrated as below:

Figure 1. Organization of the Research Paper

Source: Figured by author
2.1. Introduction

This chapter examines the review of literature I have organized the discussion based on Figure 2 that reflects my theoretical framework. My theoretical framework is based on my reading of Damsgaard and Gao 2007; World Bank 2018; Kloosterhuis and Bergeijk 2005 and Crabtree 2006: 6. The research paper will use this framework to structure the review of literature.

**Figure 2 Theoretical Framework Demonstrating A Visual Interaction of the Variables that Influence Mobile Technology Change and Performance**

![Theoretical Framework Diagram](image_url)

*Source: Figure by Author*

2.2. The Process of Telecommunications Change

Since 1990, Sub-Saharan Africa has undergone technological changes in mobile telecommunications. The previous existence of traditional methods of communication such as telegraphy, faxing and fixed telephone lines advanced to include services such as broadband, cloud sourcing services and internet data services. This “improved access to use information, thereby reducing search costs” (Aker and Mbiti 2010: 213).

Telecommunication firms use innovation to ensure sustainability in the market. Firms innovate to ensure that they can sustain their existence in the industry and develop competitiveness for the market (Christensen et al. 2011: 5). **Figure 3** below demonstrates how innovation in mobile technology evolved during the 1990’s, dominated by industry monopoly in the public sector which was underwent policy reforms to privatize and establish independent regulators. By
2000, the introduction of wireless mobile services documents the struggles of an independent regulator in a bureaucratic system and weak anti-trust rules which protect consumers from predatory behaviour of firms and “anti-competitive practises of private-sector elites, but also the anticompetitive practices of state-owned enterprises and unnecessarily competition restricting laws and regulations” (Aydin and Büthe 2016: 31). Moreover, the elements of power and trust are critical to the functionality of independent regulators (IEG 2011). Braathen (2004: 34) documents that trust within public institutions is pre-determined within agency or the bureaucracy of the system which is a characterization of monopoly (Braathen 2004: 34).

*Figure 3. Evolution of Technology Changing Mobile Telecommunications*

![Evolution of Technology Changing Mobile Telecommunications](image)

Source: IEG 2011

2.3. Theoretical Framework for Understanding Technology Change and Factors Influencing Technology Development

2.3.1. *Economic Theory of Institutions*

This theory places a rational position with which an agent maximizes their economic value. The rationality is that institutions are not the primary focus, but rather the existence of choice and ideology and the significant impact of individual interaction through multiple cooperation. This argumentation anchors on the formation of “institutions and the way they evolve shape the performance of economies over time” (North 2016: 73-74). However, this theory exudes limitations while expounding on exogenous factors such as competitors that influence institutional changes. “When the changes in social conditions are considered exogenous, they are thereby deemed unexplainable within the economic model” Boland (1979: 1). Therefore, this theory is unsuitable to this research since the technology change in telecommunications is exogenous.
2.3.2. Institutional Theory

The applicability of Institutional theory as a tool for analysis in this paper illustrates how institutions play a role in formulation of policies and implementation to enable technology change in the telecommunications industry. Institutional theory examines the role of institutions and organisations to influence economic policies and how the institutions transform due to the changing environment (Berthod 2016: 2). The applicability of this theory has been adopted by Braathen (2004: 26), who documents that the theory was applicable to assess how ‘institutions shape’ telecommunications industry including individual choices and external influences. The focus on Mozambique’s and Zimbabwe’s telecommunications industry heightens the applicability of the theory to expound on how varied levels of institutionalism impact governments action towards a specific industry. The interaction between professionalism and neo-patrimonial where the former attributes power and trust especially in Africa (Braathen 2004: 26-33). In hindsight, Braathen deviates from the focus of this research paper by analysing “the hierarchic relationship between the sector leadership and the main professionals” (Braathen 2004: 32). Nevertheless, the study signifies the importance of institutions in telecommunications and how institutions play a role in formulation of policies and how these policies influence technology change in the telecommunications industry in Ghana and Kenya. Institutional theory “analyses the necessary involvement of institutions in promoting infrastructure innovation and market transformation. From this perspective, the innovation of mobile telecommunications infrastructure will be possible only if coordinated action takes place for which institutions play an important role” (Damsgaard and Gao 2007: 172).

Mobile telecommunications technology change defines how institutions are shaped by these changes and vice versa. The telecommunications market policy reform involves institutions such as the government and the regulatory bodies which shape policy to influence mobile technology change (Nelson and Nelson 2002: 2). Nevertheless, the theory is critiqued by Mohamed (2017: 151) who argues Pava’s sentiments that the institutional theory exhibits weakness due to the changing nature of the interacting environment which influences how institutions react. Moreover, as institutions develop “human ideation, creative ideas and emotions are systematically avoided” (as cited Mohamed 2017: 151).

Strengthening institutions encompasses a holistic institutional transformation of the “social processes of institutional change, political and socio-economic power” (Groenewegen and Künneke 2005: 21). The structural changes deliver institutional changes that necessitate the need for strong institutions and effective legal frameworks for industry development. The theory contends that institutions gain legitimacy by interacting with the surroundings to function efficiently through formalities such as “legal structures, property rights and how they influence economic behavior” (Groenewegen and Künneke 2005: 3).
2.4. Technological Change in Mobile Telecommunications

Technology change in mobile telecommunications is influenced by infrastructure innovation which provides a platform for offering access to mobile services and internet data. “The infrastructure innovation involves both radical and evolutionary shifts in its underlying technologies” (Damsgaard and Gao 2007: 187). To assess these shifts the World Bank documents the need to evaluate telecommunications infrastructure using the following indicators: Mobile cellular subscriptions per 100 persons, Fixed telephone subscriptions per 100 people, Fixed broadband subscriptions per 100 people, and secure internet servers per 1 Million people (World Bank 2018). these indicators assessed how technology change occurred.

Technology change in mobile telecommunications has generated a lot of interest in the last two decades. The change evolves due to increased innovation by firms as a competitive strategy applied by new entrants (Crabtree 2006: 8). To evaluate the extent to which technology change occurs, it is important to consider how regulatory structures contribute to the process, what changes occur, and their value to society (Christensen et al. 2011: 2).

Mobile technological changes “are built upon networked technologies and infrastructure. Its transformation involves evolutionary innovation” (Damsgaard and Gao 2007: 172). entry of new operators also creates innovation. Nonetheless, most operators ‘innovate without ever inventing’ which implicates how technology change diffuses in developing countries without undertaking research and development (Jaffe et al. 2002: 43). In this case, we address the factors that contributed to telecommunications technology change using telecommunications infrastructure to assess the contribution of infrastructure innovation Damsgaard and Gao 2007: 172).

2.5. Government in Telecommunications

The government is an important institution in the telecommunications industry. It establishes institutions that regulate the industry to nurture competition and develop governing policies. “The government can employ in pursuing control over entry, rates, access charges, conditions for operations and technical standards” (Nam 2000: 357). De-regulation of network industries is executed through legislative bodies. They provide an oversight role as well as implementing policies and institutional reforms of network industries. Moreover, the regulatory bodies ensure that competition policy, corporate governance and sectoral reforms” prevail (de Rosa and Malyshev 2008: 4).

The government positions telecommunication infrastructure on an autonomous path to sustained growth through policy formulation, implementation and financing. Telecommunication infrastructure is an integral part for continuous growth of industry. Technology change in telecommunications has increased the costs associated with
sophisticated telecommunication infrastructure. Network industries encounter significant costs to purchase and invest in equipment’s such as ‘transmitters and fibre optic cables’. To bridge these costs ITU recommends telecommunication infrastructure sharing. The role of the government is to mobilize resources through the Universal Service Fund (USF) to invest in rural telecommunication infrastructure and to formulate policies in infrastructure sharing (Sozzi 1996: 434-437: ITU 2013).

The government provides a platform for development and implementation of policies that affect the industry. The policies and regulations are formulated and implemented by the government institutions. The government provides “the institutional and physical conditions and the policy environment necessary to promote the initial stages of industrialization” (Adelman 1999: 12).

The government has a functional role in the de-regulation of industry to provide an enabling environment that attracts investors in the industry hence competition. In telecommunications, the government is instrumental in the elimination of structural barriers that hindered competition and privatization. Providing an enabling environment for competition is a government function. Government implements policies that ensure there is fair competition and sustainability for all in the market (ChristianAid 2012: 1).

Through competition, the sustainability of firms encourages innovation through a process of ‘creative destruction’. In this regard, the government provides a platform for innovation through provision of funds or any supplementary assets that contribute to the innovative process. This platform propels innovators towards “shaping the opportunities that innovators target” (Christensen et al. 2011: 2).

2.6. De-regulation and Re-regulation in Mobile Telecommunications Industry

Liberalization of the telecommunications industry gained momentum in 1990’s (Kloosterhuis and Bergeijk 2005: 67). The need to reform the industry was created to improve efficiency, improve quality, and productivity of markets by eliminating monopolies which resulted into uncompetitive markets. Telecommunication monopoly was characterized by basic services such as voice calls. The inefficiency of a monopoly in an industry affects the growth of the industry (ICC 2007: 9).

The telecommunications industry achieves competition by liberalizing the industry from entry of new innovative entrants. The entry of new investors creates a competitive environment for technological growth in the mobile telecom industry and increases FDI (ICC 2007: 9). Nevertheless, the success of the operator is dependent on the timing to enter a market. “The choice of market-entry time is one of the major reasons for new product success or failure” (Lilien and Yoon 1990: 1).
Telecommunication de-regulation influences mobile technology change. In Europe, the telecommunications industry experienced rapid technology change after liberalization. Evidence in Ireland, Denmark and United Kingdom indicate rapid technology change after the telecommunications paradigm shift in 1990 (Procházka 2014: 117). De-regulation is important for increased competition which leads to technology change. Deregulation and competition policy have an interwoven consequence to “improve transparency of (world) product markets, reduce transportation costs and foster both domestic and international competition” (Bergeijk and Haffner 1996: 10). Therefore, the considerations for reforms have a fundamental impact on network development, especially in telecommunications industry. The inserts of competition policy in telecommunications bring forward the element of anti-trust which is a remnant of efficiency of the regulatory body. The regulator body is designed in a manner to assess and understand the market needs in order to highlight an effective anti-trust policy. The regulatory body substantiates the “capability to dismantle private and public barriers to competition” (Aydin and Büthe 2016: 3).

Liberalization of industry entails developing strong, effective and independent regulators. The role of regulatory institutions is to establish an enabling environment for competitiveness and enforce telecom reforms and policies (ICC 2007). Bureaucratic interferences hinder the independency of these regulatory bodies because those involved “sometimes include their objectives as part of the public interest. This rent-seeking behaviour sometimes leads to telecommunications regulators to impose policies that have little to do with telecommunications markets” (Economides 2004: 52). Therefore, developing independent bodies that are flexible improves the implementation of policies.

2.7. Telecommunications Infrastructure

Telecommunications infrastructure has a pivotal role in industry growth and technology evolution. Old and new infrastructures in telecommunications have an impact on economic growth and industry development. The report indicates expanding telecommunication infrastructure impacts the growth mobile services. This growth is experienced at both the micro and macro level. “At the micro level, telecom investment in low- and middle-income countries tend to generate internal rates of return of approximately 20 percent and economic rates of return that are even higher” (World Bank 2002: 6).

While assessing the telecommunications infrastructure, the world bank recommends analyzing indicators such as; Mobile cellular subscriptions per 100 people; Fixed telephone subscription per 100 people; fixed broadband subscription per 100 people and lastly Individual internet percent population. The same report evidenced that a cross-country survey showed that the number of telephones per 100 people had an impact on the (GDP), increased income and macroeconomic growth. The higher the number of telephones, and density, the higher the
income and growth rates, the lower the number of telephone accessibility and teledensity per 100 people, the lower the growth rate and subsequent slow economic growth (World Bank 2002; World Bank 2018).

2.8. Competition Policy in Telecommunications Industry

The paradigm shift from monopoly to telecommunications liberalization between 1990-1999 lay a foundation for establishing competition policy. Competition policy is derived from an increasing entry of new entrants into the market, then eliminating bureaucratic and monopolistic entities. Increased competition in an industry interrogates the customer preferences by variation of innovative products and services. This increases consumer demand, which enables operators to innovate to meet the demands and the global paradigm shifts in mobile technology. This creates a conducive atmosphere for competition to thrive (Whiteman 1990: 47).

A more liberated industry increases competition due to new entrants to position themselves in transforming the industry through new ideas and strategies for growth and diversification of industry (Lal and Strachan 2014: 14). Competition and Innovation are crucial for the survival of network operators. Innovation in the telecommunications industry is a key driver to increase competition and expansion of industry. The competitiveness of the telecommunications industry is largely defined by the financial performance and technology innovativeness. The firms market share and consistent innovation of new products and services determine the profitability and market penetration (Lee et al. 2011).

2.9. Conclusion

The theoretical framework presents a holistic approach to address the research question and critically addresses the research problem. This framework integrates telecommunications liberalizations as instrumental to driving technology change in mobile telecommunications for development. Liberalization of industry is instituted by the government through policy formulation and regulatory role through statutory bodies. Further, telecommunications infrastructure sharing and investment are important divers for telecommunication expansion to increase mobile cellular subscriptions (per 100 people) and individual internet percent population.
Chapter 3. Mobile Telecommunications Technology and Its Significance to Development

3.1. Introduction

This Chapter examines how mobile telecommunications technology has played a significant role in economic development. The chapter takes a general approach to address the significance of mobile industry to improving the livelihoods of the people particularly in rural and remote areas creating new possibilities.

3.2. Mobile Technology and its Contribution to Economic Growth Sub-Saharan Africa

The relationship between the telecommunications industry and economic development is important. This is because the telecommunications industry creates an enabling environment for economic growth through FDI from new entrants who develop mobile telecommunications infrastructure. Telecommunications infrastructures increase mobile cellular penetration which improves the accessibility of information through mobile digital means such as text messages, mobile application apps. Increasing accessibility of mobile cellular services reduces transaction costs in rural and marginalised areas thus increasing the affordability of mobile services due to improved infrastructure. Reduced costs of operations improve the quality of information. “Lower communication costs lead to more information on the probability distribution of prices and permit the transformation of uncertainty into risk” (Norton 1992: 177).

Telecommunications infrastructure has a significant role in the economic development of developing countries. Investing in mobile telecommunication infrastructure is pivotal to improving mobile technology. Therefore, increasing investment in telecommunications infrastructure will enable penetration of services such as internet and increased mobile penetration (World Bank 2002). The impact of investing in telecommunication equipment such as fibre optic cable, ISDN lines and signal transmitters increases firm revenue due to the wide coverage and increased internet and mobile subscriptions (Greenstein and Spiller 1996: 29). Telecommunications infrastructure contributes to the development of developed countries by a margin of more than 50% compared to developing countries (Gruber et al. 2011).

Lee et al. (2011: 4-5) conducted an empirical analysis of telecommunications and economic growth in 44 Sub-Saharan African countries. The study focused on the growth of mobile telecommunications and how different technologies such as fixed telephone lines and mobile devices have contributed to economic development. In the estimation model, the analysis applies the use of different variables such as GDP per capita assessing the degree of openness of a country’s economy and population growth rate. The findings identify a positive correlation between the growth rate of GDP and fixed telephone lines per 100 persons. When the study estimated for the growth rate of GDP and mobile subscriptions per 100 persons the results indicate a positive correlation. Nonetheless, the latter demonstrated a statistically insignificant
result given that estimation period used in the study was before structural changes of reforms of policies and institution which took effect from 2000 (Lee at al. 2011: 4-5).

Gruber et al. (2011) conducted a study to assess the impact of mobile telecommunications on economic growth in 194 countries between 1990-2007. The study assesses the endogenous growth model to estimate the ‘weighted average of OLS coefficients. Telecommunications infrastructure and productivity demonstrated a causal relationship in developing countries. While estimating for telecommunications and national output, the results indicated that there was an impact on economic growth. The latter having been controlled for ‘capital and labour’. The results for estimating economic growth and telecommunications were significantly positive (Gruber et al. 2011).

Nonetheless, World Bank (2009) dissects this positive relationship began in 2000 after de-regulation of industry, especially in developing countries. More so, liberalization enables mobile technology change to occur. The period before deregulation indicate how telecommunications technology was scarce, evidence from 43 developed countries indicated that between 1975 and 1990, the estimation results for telecommunications and economic growth were statistically significant with a positive correlation (Lee et al. 2011: 2). This demonstrated the conclusion that the impact of mobile telecommunications on economic growth varies between developing countries and those that are developed. (Grubers et al. 2011). In figure 4 Below, the graph demonstrates the findings of a cross-country analysis on the impact of telecommunications on growth rate and the x-axis represents the number of years of mobile penetration. Low middle-income countries are in the bottom of the graph with a margin of between 0-2 years maximum, the growth rate for this period was below between 0.1% and 0.15% for developing countries with low income. Further, the growth rate increases as the number of years increases. Upper-middle-income countries which also fall in the developing world categories such as Tunisia, Russian Federation and Georgia are upper-middle-income countries with a GNI per capita of between $ 4, 036 and $ 12, 475 (World Bank 2016). The figure below demonstrates that mobile telecommunications do contribute to economic growth. For most developed countries classified as high income, the relationship is stronger especially if the country is categorised under OECD compared to High income non-OECD (Gruber et al. 2011). The differences the rate of returns between low middle income and high middle income is due to the delay to de-regulate telecommunications and limited telecommunications infrastructure (Starr 1990).
3.3. Mobile Technology Improving Livelihoods

Mobile phones improve the livelihoods in developing countries. Different studies in developing countries have indicated that mobile telecommunications has significant impact on Health delivery services, education. Mobile technology has improved that access of information on health services such as telemedicine which reminds HIV patients to take their medicines on time (Aker and Mbiti 2010: 222-223). Mobile technology has had a positive impact on health services. mHealth a mobile technology solution has demonstrated significant improvements to access medical statements and medication. Across SSA mobile penetration has improved access to a variety of different of mobile such as MAMA SMS in South Africa and Rapid SMS in Rwanda. See table 2 for a summary of mobile health services in selected parts of SSA (AHO 2015).

The significance of mobile services also highlights the importance to alleviate poverty. Mobile telecommunications penetration to the rural areas improves the livelihoods of people. Through mobile technology, the marginalized people can access services that were previously unavailable to them. Delivering services such as eLearning have profound impact on poverty reduction in developing countries. For instance, the contribution of a digital eLearning platform dubbed Village eScience for Life (VeSel) which is "aimed at identifying and developing suitable
information and communication technologies for groups of rural farmers to promote eScience” (Camara et al. 2010: 1) and primary education.

Table 2. A Summary of Mobile Technology Health Services in Selected African Countries.

<table>
<thead>
<tr>
<th>Country</th>
<th>Type of service</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>mHealth: Jami Smart Sent via SMS</td>
<td>Confirm the authenticity of health providers and their qualifications and provide information to pregnant women on safe motherhood.</td>
</tr>
<tr>
<td>Ghana</td>
<td>Mobile Technology for Community Health (MOTECH) initiative</td>
<td>Information access to rural mothers on child care</td>
</tr>
<tr>
<td>Mozambique</td>
<td>SMS</td>
<td>Send reminders to HIV patients about adherence and prevention of mother to child transmission.</td>
</tr>
<tr>
<td>Nigeria</td>
<td>SMS Printers to Accelerate Return of Test (SMART)</td>
<td>Improve communication of early infant diagnosis of HIV/AIDS from the laboratories to health centres.</td>
</tr>
<tr>
<td>Rwanda</td>
<td>RapidSMS and mUbuzima</td>
<td>Track pregnant women with life threatening conditions for both mother and child</td>
</tr>
<tr>
<td>South Africa</td>
<td>MAMA SMS services</td>
<td>Send SMS support to local languages</td>
</tr>
</tbody>
</table>


The introduction of mobile telecommunications improves food security in developing countries. Mobile telecommunications technology has reduced food wastage and time, and improved information-based transaction cost. Farmers in marginalized areas access information regarding market availability for their produce using mobile phones. The farmer can eliminate time wastage to by prioritizing the market that has more returns as compared to the one that is costlier by factoring the geographical distance (Overå 2006: 1308). Therefore, the farmer “can put resources where they are most needed and most valued. Resources can be better coordinated between sectors and across geographies” (Lee et al. 2011: 1). In Niger, mobile technology reduced the transacting costs and wastage for traded goods such as grain (Aker and Mbiti 2010: 215). In Ethiopia, telecommunications infrastructure expansion improved communication between buyers and sellers trading in cash crops such as coffee after. The empirical analysis also indicated that transaction costs were reduced (as cited Norton 1992: 178). The presence of mobile innovations enables farmers to maximize their yield by reducing the distance previously encountered while searching for markets. With mobile phones, the individual can access information instantly. Nevertheless, it is crucial to realize that
“information-based transaction costs are found to be a significant proportion of the total transaction costs incurred by farmers” (de Silva et al. 2008: 4).

Multinational corporations entering developing markets generate work opportunities and increased tax returns which contributes to macroeconomic development. Employment opportunities are generated through direct employment to the telecommunications company for positions such as managers or technical jobs such as telecoms equipment operators and human resources. In other forms of employment, the industry has contributed to indirect form of employment, such as retailers in the industry selling airtime and other products and services such as sim card replacement. The industry has also created opportunities for mobile applications, call centres and supply-chain deliveries of other goods and services in the firms that enable a company to operate on a day to day basis (Andelkovic and Imaizumi 2013: 98). In Kenya, telecommunications has contributed to the growth of the mobile APPs which led to the establishment of incubation centres to nurture innovative skills and provide a platform or access free internet for App developer. The number of Internet Service Providers has increased thus generating employment (ICT Authority n.d.).

3.4. Infrastructure Innovation in Sub-Saharan Africa

Mobile telecommunications technology has contributed to economic development. To achieve this, internet provision is paramount to ensure that mobile technology contributes to this evolutionally change. Nevertheless, internet access in developing countries remains elusive. Therefore, in the last one decade, infrastructure innovation in telecommunications has evolved through air balloons designed to provide satellite services for internet data in rural areas and remote areas (See text box 1 for further details). The baseline for these innovations is to ensure that data provision is “more efficient, to carry a much higher volume of information, at a lower cost” (ITU 1999). Therefore, in this section I will illustrate infrastructure innovations in Kenya.
Text Box 1. Current development in Mobile Telecommunication Infrastructure

**Project Loon in Kenya**

Project Loon is a Google initiative “to provide internet access to unserved and underserved areas around the world. Loon combines advancements in material science and atmospheric modelling, machine learning and communicating systems and more” (Loon 2011). The technology utilizes the lift of an airborne balloon. Loon is a sustainable project given the components of its functionality are ‘green’. The balloon is designed to float in the stratosphere, higher than Planes and weather disruptions. The balloon is also ‘filled with helium and is powered by solar panels’ (BBC 2018).

Project Loon – Kenya was launched in the Kenyan market in 2018. The project was launched under the partnership with Telkom Kenya, the partnership documents that Telkom Kenya provides service signals whereas Loon will distribute the signals for to cover 5, 000 sq. kms (BBC 2018). The operations details that Loon will provide accessibility of 4G/LTE internet service in rural areas and semi-urban centres such as: Ngong, Kitengela, Limuru, Kiambu etc. The services will be a step further to reducing the ratio of 1GB data to 2% GNI which is currently at 1GB to 18% of GNI in Africa (BBC 2018).

*Figure 5. Loon in the Stratosphere*

Source: Loon 2011 (https://loon.co/journey/)

**Express Wi-Fi by Facebook Joins the Kenyan Market**

Express Wi-Fi collaborates with selected service providers to expand connectivity to low population density locations in Kenya and other parts of Africa such as Nigeria, India and Indonesia. Following the launch of Project Loon’, Facebook launched Express Wi-Fi and partnered with Surf Kenya to provide internet services in Nairobi and its immediate environs. According to the Daily Nation (2017), “the network will provide “daily data bundles at a cost of Ksh.10 for 40 MB and Ksh. 20 MB; weekly bundles will cost Ksh. 50 for 300 MBs and 100 for 500 MBs”. Compared to the other three MNOs, Express WiFi is affordable given that at a cost of Ksh. 50 Safaricom, Airtel and Telkom Kenya offer 65MB, 50MB and 400 MB respectively (Daily Nation 2017).

3.5. Conclusion

Technology change in mobile telecommunications has contributed to the developmental change in Sub-Sahara Africa. Education, agricultural farming and Health have experienced significant improvement to access information through mobile phones. The provision of mobile services has revolutionized access to information in the rural areas.
Chapter 4. Government Stimulating Telecommunications Industry Performance

4.1. Introduction

This chapter examines the role of the government as an institution and its role in the telecommunications sector. In this chapter, the study identifies key policy issues implemented by the government to stimulate the telecommunications industry and the institutions associated with telecommunications regulations. Some of the issues identifies include; policy formulation in telecommunication infrastructure, competition policy and regulation and regulatory and institutional frameworks that formulate and implement these policies.

4.2. Policy Formulation in Telecommunication Infrastructure Sharing

Telecommunications infrastructure sharing is an important facet for a thriving industry. Government policies in infrastructure sharing indicate that industries that adopt tower sharing efforts have a progressive growth of the telecommunications industry and improved fair competition due to reduction of costs for operations. New Zealand and Germany incorporated infrastructure sharing policies to navigate the high costs associated with individual firms investing in telecommunications infrastructure. In Europe, countries such as Sweden and Norway are mandated to a 30% infrastructure share. The results of this infrastructure sharing mechanism improved competition between MNOs (ITU n.d.).

In Sub-Sahara Africa, Ghana, Uganda and South Africa are among the countries that have implemented a network sharing framework. In 2008, Ghana initiated the tower sharing framework under the Electronic Communications Act of 2008 was enacted to curb infrastructure expansion costs and improve competition among MNOs in Ghana (see table 3.). The ensuing market share structure is ‘reasonably’ within threshold where the leading operator has a 47% market share compared to Kenya whose leading operator has 69% market share (Haggarty et al. 2003: NCA n.d.; CAK 2016/2017: 10).

Implementation of a network sharing framework by NCA improved access to mobile services in the rural areas in Ghana. The framework was designed to ensure that three tower companies were allowed into agreement with MNO’s in Ghana under the regulations of NCA. The contentious issues addressed in the framework includes sharing mechanisms such as site sharing, Mast sharing, RAN Sharing, Network roaming and core network roaming. Nevertheless, the framework also identifies the potential to “erosion of competitive differentiation” for which it is address as a setback (Sayki-Addo n.d.). The successful implementation of the tower sharing framework reduces infrastructure costs of investment for operators; therefore, improving competition. The Ghanaian framework was developed to ensure that network towers were licensed and operated by third parties such as ‘America Towers Company, Helios and Eaton’ providing services to 4 leading operators who receive services from them. This policy has
contributed to recover costs of operations and increased mobile cellular subscription in rural areas (Osei-Owusu and Henten 2017: 4-7).

Contrary, Kenya’s infrastructure sharing policy has been contested by mobile network operators. In 2016, CAK released competitiveness of industry report which recommended that infrastructure sharing was important for Kenya to reduce cost of equipment investment and improve competitiveness of smaller players (See table 3 for a summary of the progress). Therefore, “it was not economically viable for smaller operators to extend coverage in areas of low population density given current market share and costs of tower sharing” (as cited in Kamau 2018).

Table 3. Policy Formulation in Telecommunication Infrastructure Sharing in Ghana and Kenya

<table>
<thead>
<tr>
<th>Country</th>
<th>Infrastructure sharing Policy</th>
<th>Period</th>
<th>Status and type of sharing</th>
<th>Did Government get involved</th>
<th>Tower Companies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>Recommendation by CAK</td>
<td>None</td>
<td>Not implemented &amp; passive, active</td>
<td>Through Communications Authority of Kenya a statutory regulator in telecommunications industry. Initiated a study to assess the competitiveness (Kamau 2018)</td>
<td>None</td>
</tr>
<tr>
<td>Ghana</td>
<td>Tower sharing framework (Site sharing, Mast sharing, RAN Sharing, Network roaming and core network roaming)</td>
<td>2008</td>
<td>Implemented &amp; passive infrastructure sharing</td>
<td>Through NCA oversight and policy formulation</td>
<td>America Helios Tower Company, Eaton Tower Company and Helios Tower Company</td>
</tr>
</tbody>
</table>

4.3. Regulatory and Institutional Frameworks

In the 1990’s the telecommunication paradigm shift towards liberalization was initiated by international development partners. In 1982 and 1985, Kenya and Tanzania held the first ITU conference and the World Telecommunications Development Conference respectively in SSA. The former’s outcome led to the establishment of a commission to lead to an expansive plan to liberalize the telecommunications, while the latter was evaluated the recommendations of the commission. In 1993, the World Trade Organization concluded the Uruguay Round whereby the texts recommendations in the telecommunications industry were assessed (Mureithi n.d.; Ebo 2010: 1).

Since these two conferences, the formation of institutions and effective legal frameworks were consistent with the key prerequisites for sustainable advancement in telecommunication. Since 1990, both Ghana and Kenya have experienced gradual and consistent legal formulation and creation of regulatory institutions. The ministry of Transport and Communication initiated the ADP programme in 1994. The formation of these institutions is anchored within the constitutional Acts of parliament whereby through ADP-2000, Ghana Frequency Regulation and Control Board (GFRCB) was established to issue operator licenses in Ghana. As of 1996, the agency had issued 3 operator licenses to Mobitel, celtel and Spacefon (Ebo 2010: 7-9). On the other hand, Kenya enacted the RTMPC Act in 1988 to eliminate monopolies from the industry and to establish competition. This led to the formation of the MCP (Gachagua 2004).

The elimination of monopolies in Ghana and Kenya was eliminated at different times. In 1998, Kenya enacted the ‘Kenya Communications Act of 1998’ which led to the separation of the state-owned Kenya Post and Telecommunications Corporation into three institutions i.e. Telekom Kenya, Postal Corporation of Kenya and Communication Commission of Kenya. The separation of powers was a step towards improving telecommunication services (Gachagua 2004: 2). Meanwhile, GP&T underwent reform through the ADP-2000 which recommended the elimination of state-owned institutions which were inefficient and recorded poor teledensity of ‘3 phones per 1000 inhabitants. In addition, GP&T provision of services were poor due to limited infrastructure (Haggarty et al. 2003: 7). The Statutory and Reforms Act of 1993 led to the establishment of the Ghana Telecom and an independent MNO in 1993. The reforms also institutionalised an independent operator NCA under the National Communication Act of 1996, Cap 524 (Ebo 2010: 8).

By 2000, both countries had liberalized the telecommunications industry. The millennial years led to the realization that institutional changes were inevitable as the surrounding environment changed (Berthod 2016: 2). The entry of new competitors and the changing mobile technological environment ignited more reforms in Ghana and Kenya. In 2009, Kenya Information Communication Amendment Act 2009 was enacted in 2010 which led to the disbarment of CCK and established CAK. The latter had more powers to regulate the industry
and restitute the independency of the institution (Gachagua 2004: 16). Around the same time, Ghana enacted the Electronic Communications Act of 2008 which focused on affordability and expansion of the telecommunications industry. GoG ensued to invite tower companies to bid for provision of network towers. The implementation of the infrastructure sharing framework took 7 years for MNO’s and tower companies to come into agreement in 2014 (Osie-Owusu and Henten 2017: 3).

Table 4. Summary of Regulatory and Institutional Bodies in Telecommunications in Ghana and Kenya

<table>
<thead>
<tr>
<th>Country</th>
<th>State Actors</th>
<th>International Bodies</th>
<th>Academic Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenya</td>
<td>Ministry of Information and Technology, National Communications Secretariat</td>
<td>Groupe Spéciale Mobile Association</td>
<td>Kenya Institute of Mass Telecommunications</td>
</tr>
</tbody>
</table>


4.4. Competition Regulation

Telecommunications competition policy has undergone rapid changes. The industry has experienced structural changes that began in the early 1990’s. The shift from state-owned monopolies meant de-regulating and privatizing the industry. Ghana and Kenya had experienced monopolies which were eliminated in the early 1990’s. In Ghana, the telecommunications industry trajectory required de-regulation of industry followed by monopoly elimination and privatization of GP&T to allow for the second operator (Haggarty et al. 2003: 4). In Kenya, the process toward liberalization and privatization of the
telecommunications industry began in 1990’s. In 1998, the government enacted the Economic Reforms of 1998 which fully liberalized the industry leading to entry of Safaricom and Airtel in 2000 (Otieno and Aligula 2006: ii). These two countries depict the major milestones in the process to move towards competition.

The existence of competition polices in telecommunications sector in Ghana and Kenya was developed in the early 1990’s. Ghana, developed ADP 2000 between 1994 – 2000 to mandate to eliminate state-owned monopoly and allow a second national operator to provide telecommunications services. The emergence of this policy allowed for increased competitiveness which lead to an entry of four member by 2000 (Ebo 2010: 7). In Kenya, RTMPC was the first competition law in the 1990’s that was mandated to redefine the competitive structures through the establishment of MPC (Gachagua 2004).

Competition policy laws oppose the existence of ‘abuse of dominant position’. A firm that dominates a market with ‘predatory, discriminatory exploitations’ are ‘unfair’ (Kloosterhuis and Bergeijk 2005: 74). The Competition Act of 2010 Section 24(1) “Prohibits any abuse of a dominant position by an undertaking in a market for goods or services in Kenya” (CAoK n.d.). The existence of a dominant network operator with a market share more than one half of the market is substantiated as a ‘dominant position’ (CAoK n.d.). In Kenya, Safaricom has a dominant position in the market exhibiting 69% of the total market share. In Ghana, the largest MNO has a 47% market share below the 50% which determines above as presumably dominance of market. To evaluate dominant position, a market between 50-70% market shares exude ‘a weaker presumption of dominance, any shares below 50 are contrary to dominance of market power (Malkovsky 2017: 26-27). Nevertheless, firm’s dominance might be “perfectly legitimate through innovation, adoption of superior production or distribution methods or greater entrepreneurial efforts” (World Bank 1999: 82).

The government role is positioned by the competition authority which is mandated to ensure that such dominance does not exist. ‘Unfair’ markets require regulatory measures that address the breaching threshold evoked by dominant operators (Fernández et al. 2014: 227).

4.5. Estimating Herfindahl index in Ghana and Kenya

Evaluating the level of competitiveness in telecommunications indicates assessing the concentration ratio of market share in Ghana and Kenya as indicated in table 5. The similarity of these ratio does not indicate the relative size of each of the largest MNO’s in either of the countries. Clearly in Kenya, close to 70% of the market share is controlled by Safaricom PLC limited while in Ghana, almost 50% of the market share in voice and data is controlled by MTN. The situation above demonstrates different market dynamics such as when each MNO has a significantly narrower margin ratio. Safaricom limited having a share of 69% of the total mobile market in Kenya which significantly increases the Herfindahl index (HHI). The Herfindahl index
is defined as the sum of the squared market shares $\Omega_i$. The Herfindahl index equals $\sum \Omega_i^2$. This indicates that the mobile market in Kenya is more concentrated so less competitive. Similar analogy applies to the mobile market in Ghana where MTN significantly has a lead in market share. However, the mobile market share in Ghana is moderately more competitive (because of a lower HHi) than mobile market in Kenya, which is dominated by Safaricom Limited. The significance of HHi is important to analyse market concentration. In this case, Kenya’s HHi is more concentrated than Ghana’s HHi index. The difference occurs due to “technical properties of their production technologies or unique characteristics of the markets” (Shughart II n.d.). HHi estimates the “market concentration index for each country, and it is calculated as the sum of the squares of market share of all firms in the market” (Gruber et al. 2011: 400).

Table 5. Calculating Ghana and Kenya’s Herfindahl index

<table>
<thead>
<tr>
<th>MNO in Ghana</th>
<th>Ghana Mobile Market Share (%)</th>
<th>Squares</th>
<th>MNO in Kenya</th>
<th>Kenya Mobile Market Share</th>
<th>Squares</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTN</td>
<td>47.53</td>
<td>2259.101</td>
<td>Safaricom Limited</td>
<td>69</td>
<td>4761</td>
</tr>
<tr>
<td>Vodafone</td>
<td>24.1</td>
<td>580.81</td>
<td>Airtel Networks Kenya</td>
<td>17.5</td>
<td>306.25</td>
</tr>
<tr>
<td>Tigo</td>
<td>14.72</td>
<td>216.6784</td>
<td>Telkom Kenya Limited</td>
<td>7.6</td>
<td>34.81</td>
</tr>
<tr>
<td>Airtel</td>
<td>11.64</td>
<td>135.4896</td>
<td>Finserve Africa Limited (Equitel)</td>
<td>5.9</td>
<td>57.76</td>
</tr>
<tr>
<td>HHI: Total Sum of Squares</td>
<td>3192.119</td>
<td></td>
<td>HHI: Total Sum of Squares</td>
<td>5159.82</td>
<td></td>
</tr>
</tbody>
</table>

4.6. Mobile Innovation Incubation Centres: Mobile Technology for Better Socio-Economic Services

The mobile technology innovation has stimulated the development of mobile applications. These innovations have contributed to the development of mobile applications services which are improving livelihoods in developing countries. mHealth and eLearning mobile applications are a good example of how mobile applications have revolutionized technology (AHO 2015; Aker and Mbiti 2010: 220). Because of this, GoK recognized the potential of ICT to address socio-economic issues such as improving access to information and developed incubation centres to support start-ups. Moreover, incubation centres are critical for nurturing emerging start-ups to develop and advance their ideas especially in the mobile applications. The government has an important role to play through provision of an enabling environment for incubation which enhances mobilization of resources to innovate and commit fiscal resources for the operations. In Africa, Kenya is one of the leading start-up Hubs including Egypt and South Africa (see table 5.). In 2013, GoK Under the Ministry of ICT established ‘Nailab’ under the ICT Authority. Nailab is a ‘Business Incubation Project’ aimed at nurturing ICT skills that include developing e-Learning Mobile apps; a mobile based betting app; mobile app that is based on community crowd source funding; and mobile money services (ICT - Authority 2018). In Ghana, GoG established ‘Ghana Multimedia Incubator Centre under the Accelerated Development (ICT4AD) initiative. The incubation centre was established to nurture ICT skills for development of mobile applications (GoG n.d.).

Table 6. A Summary of Africa’s Leading Start-up Countries

4.7. Conclusion

The government implements different policies in telecommunications industry more than indicated above. In this study we focused policies revolving around on telecommunications infrastructure, competition policy, institutional reforms based on the framework of this research. Ghana has implemented telecommunications infrastructure sharing policy which has contributed to a higher teledensity. Nonetheless, this is not the only reason why the industry density has improved over time. The identification of these reasons requires a further analysis of the industry given that the current existing literature such as Osie-Owusu and Henten 2017 and Haggarty et al. 2003 focusses on analysing the performance of the industry but not a comparative study to examine why Ghana performed better. The study establishes that Kenya experiences ‘abuse of dominant position’ while Ghana is below the 50% threshold. Therefore, the government should formulate guidelines to deal with abuse of dominant position.

In Table 7. Is a summary of this chapter is presented to map the scenarios why Ghana performed better than Kenya? Market concentration ratio between Kenya and Ghana indicate that Kenya’s MNO market share is higher. Therefore, strengthening anti-trust policies could potentially curb this concentration (Aydin and Büthe 2016).

<table>
<thead>
<tr>
<th></th>
<th>Ghana</th>
<th>Kenya</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Competition Act No.12 of 2010 – Establishes the CAK and Competition Tribunal receives appeals from CAK.</td>
</tr>
</tbody>
</table>
✓ Teledensity expansion (1.5 & 2.5 lines per 100 people).  
<table>
<thead>
<tr>
<th><strong>Liberalization of the telecommunication</strong></th>
<th><strong>Electronic Communications Act 775</strong> – establishment of GIFEC to manage the Universal Service Funds.</th>
<th><strong>Kenya Information and Communication Act (2013)</strong> – Universal Service Advisory Council to advice CAK on USF policies.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Firms</strong></td>
<td>Six no. of MNO’s</td>
<td>Four number of Firms.</td>
</tr>
<tr>
<td></td>
<td>Namely: Scancom (MTN), Millicom (Tigo), Glo Mobile, Airtel Mobile and Vodafone Mobile</td>
<td>Namely: Safaricom, Airtel Kenya, Finserve Africa Limited, Telekom Kenya limited and Semal mobile services limited (The last two entered the market in 2015 and 2016 respective;</td>
</tr>
<tr>
<td><strong>HHi Index</strong></td>
<td>3192.11</td>
<td>5159.82</td>
</tr>
</tbody>
</table>

*Source: Otieno and Aligula 2006; Frempong 2002; Nayo 2001; Ebo 2010; ITU 2013. figured by the author*
Chapter 5. Telecommunications Industry Performance in Ghana: A Comparative Case Study Between Kenya And Ghana?

5.1. Introduction

This chapter will examine the technology changes that have occurred since 1990 and the factors that lead to Kenya’s outperformance in telecommunications. The chapter will demonstrate how the sector has performed in Ghana addressing their competitive structures, structural changes and mobile infrastructure. This section will analyse why Ghana was more successful in mobile telecommunications compared with Kenya.

5.2. The Making of Mobile Telecommunications in Sub-Saharan Africa

The telecommunications industry in Africa has been undergoing significant transformations since 1990. The remarkable process began when the rest of the world especially was restructuring their regulatory frameworks in the telecommunications sector. The focus on these reforms sought to eliminate public owned monopolies which were dominant in the 1990’s. The process of deregulation in developed countries was primarily enhanced by the global shift for an open economy, which was deemed to be beneficial for developed countries to establish a competitive frame for industry growth (Kloosterhuis and Bergeijk 2005: 67). In Europe, the liberalization process was particularly successful due to considerations to eliminate monopolies and eliminate barriers in all sectors in the telecommunications sector including “terminal equipment, value-added services, satellite equipment and services, cable TV networks and mobile communications” (Liikanen 2011: 2).

The scarcity of mobile services in Sub-Sahara Africa (SSA) and the affordability of mobile devices in 1990 resulted to slow the industry’s growth. Accessibility and the costs to purchase and maintain a mobile device was expensive such that only the affluent could afford. Therefore, between 1990 and 1995, the use of mobile density was low whereas fixed telephone density was higher (figure 6) Between 2000 and 2008, mobile density indicates a rapid growth and “a strong positive correlation with population density” (Aker and Mbiti 2010: 209).

Liberalization in the telecommunications industry was implemented at different times in Ghana and Kenya. The difference resulted in timelines and strategies generating different densities in the long-run. Ghana liberalized its industry earlier than Kenya in 1993. The liberalization of the industry established a competitive market which increased attractiveness leading to more operators to enter the market during the ADP-2000 implementation period (Haggarty et al. 2003). On the other hand, Safaricom and Kencell were the first privately owned operators to enter the Kenyan Market in 2000 after the Economic Reforms of 1996-1998. The entry of new competitors steered the industry to innovativeness. Mobile devices were more accessible, and the telecommunication density increased rapidly (Gachagua 2004: 17).
Between 2003 and 2006 Kenya had a higher penetration rate compared to Ghana. By 2005, Ghana experiences a significant increase in mobile cellular subscription per 100 people. The rapid increase was because of implementing the universal access fund which was key to expanding mobile infrastructure to rural areas and previously unserved areas (Ellis et al. 2010: 7). Kenya began to implement universal access fund in 2014 after a long tussle with MNOs (R. Wanjiku 2014). Between 2012 and 2016, Kenya’s mobile subscription rate has been coherent with the rest of Sub-Sahara Africa. However, Ghana’s mobile subscription rapidly increased and surpassed Kenya. Ghana has a higher number of mobile operators (5 as of 2017) compared to Kenya which has 3 MNOs leading operators and 2 new entrants (CAK 2016/2017). The effect of this is evident on the role of MNO to increase competitiveness for markets; therefore, subscriptions increased. In 2009, Ghana surpassed Kenya’s mobile subscription. In a span of 5 years the penetration rate increased from 54% to 67% in 2012 and 2016 respectively. Ghana connected the first submarine fibre optic cable in 2012 and the second one in 2013 (GSMA 2017: 9). As of 2012 onwards Kenya’s mobile subscription rate became constant. This is due to high corporate tax including universal access fund. Compare to Ghana, Kenya has a higher mobile income tax of 10% the latter 6%. The increase in mobile VAT has impacted mobile subscription by 58% per year per user (Ndwiga and Irungu 2009).

Figure 6. Trends in Mobile Cellular Subscriptions (Per 100 People) 1995-2016

Access to the internet came into the domain in the 1990’s. Between 1990 and 1995, internet infrastructure such as secure number of internet server per 1 million was obsolete. The lack of internet services was also embedded on the availability of affordable data, internet connections and PCs. Accessibility of internet services was commercialized through internet service providers. ISPs increased after the liberalization of the telecommunications industry in Africa. Between 2002 and 2003, internet connectivity in different countries of Sub-Sahara had increased due to the increasing number of public ISPs. South Africa was leading in internet connectivity due to the high number of ISPs, (80 in 2002) whereas in Kenya there were 34 ISP in 2001 (Oyelaran-Oyeyinka and Adeya 2004: 68). Internet density between Ghana and Kenya increased in parallel with a minimal internet density percent population margin between 1996 and 2002. This is due to the implementation of ADP 2000 and privatization of Ghana Telecom to allow a third competitor to increase telecom services (Haggarty et al. 2003: 3) and the entry of Safaricom and Kencell in 2000 in Kenya. The latter had deregulated the industry and ISP providers increased internet services available to estimated 400, 000 subscribers whereas, Ghana had 200, 000 internet subscriptions in 2002 (Foster et al. 2004: 5). The number of ISPs in Kenya between 2002 to 2003 was 72 higher than Ghana which had 14 ISPs. (NISL 2012: 14; Foster et al. 2004: 38) (See figure 6).

**Figure 7. Individuals Using the Internet (Percent Population) 1996-2016**

5.3. Why did Ghana perform better in Telecommunications Subscriptions Compared to Kenya?

In this section, the study will assess the reasons why Ghana’s performance in mobile cellular subscriptions per 100 people and internet usage percent population compared to Kenya is higher. Therefore, in this part I will provide a detailed analysis of the trends and factors identified during the analysis will be provided to explain this exemplary growth.

5.4. Telecommunications Liberalization and Infrastructure Growth.

The urge to develop and de-regulate the telecommunications industry began in 1990’s. Global trends and reforms motivated by developed countries such as the Netherlands and United Kingdom and development partners such as the World Bank and International Monetary Fund ignited the reactions in developing countries to reform the telecommunications sector to eliminate monopolies and increase the entry of new competitor and privatization (Kloosterhuis and Bergeijk 2005: 67; Starr 1990).

In sub-Sahara Africa the case is no different between our case studies Ghana and Kenya. In the 1990’s both countries were undergoing structural changes to reform the telecommunications industry. Nonetheless, the process of reforms encompassed different strategies and focused to develop the telecommunications sector. Bottom-line is, both countries agreed that de-regulation of the industry is important to spur growth of mobile industry and increased competitiveness. “The impact of telecommunications on competitiveness and liberalization depends on their position in competitive strategies” (Rallet 1994: 119).

In 1994, Ghana’s telecommunications industry introduced a restructuring plan known as ‘Accelerated Development Programme (ADP - 2000). The orientation of the plan marks the beginning of revolutionizing the telecommunications sector. ADP 2000, focused on increasing the teledensity from 1.5 to 2.5 lines per 100 people; increased fixed telephone infrastructure; affordable pricing tariffs; long-term implementation of the Universal Public Access fund; telecom infrastructure in urban and rural area with a 250 inhabitants benchmark; competitive structure detailing mergers, ownership, acquisition and control of the telecommunications operators; establishment of the National Communications Authority (Frempong 2002: 4).

The realization of ADP-2000 and RTMPC underpin different strategic focus and consequentially the resulting impact. Firstly, ADP focused on improving teledensity, establishment of an independent telecom operator from Ghana Post and Telecommunication Corporation and Ghana Telcom was established in 1995, which contributed to the development of the industry to an earlier start (Ebo 2010; Gachagua 2004). GoG established an expansion plan whereby, the second national operator would specifically operate in the rural areas providing telephone services in the southern region (Frempong 2002: 3-5). The access to mobile services in rural
and urban areas was a priority for ADP plan. During a five-year period, ADP success in mobile teledensity is evidenced in table 8. The increase in mobile and fixed telephone subscriptions between 1994 and 2000. Fixed telephone subscription per 100 people increased from 0.306 to 1.122 between 1994 and 2000 respectively. In addition, mobile cellular subscription (per 100 people) also increased from 0.0204 to 0.686 in 1999 and 2000 respectively. While this increase did not achieve the target density of 1.5 and 2.5 lines per 100 people. A decade after the implementation period of ADP, mobile technology was introduced in Ghana which increased the subscription of mobile cellular while fixed telephone subscriptions (per 100 people) decreased. Between 2013 and 2014 the telecommunications industry experienced decrease in the number of mobile subscriptions per 100 people due to the imposed 10% levy in Kenya and 6% in Ghana on mobile handsets and smartphones (Deloitte and GSMA 2011: 3). This tax negatively affected the purchasing of mobile phones which affected mobile cellular subscriptions. As a result, the GoG through the ministry of Finance announced a tax-exempt strategy to eliminate custom duties in 2015 and increase subscription of mobile services. (Deloitte and GSMA 2011: 62).

In Kenya, the RTMPC Act focused on eliminating entry barriers through industry liberalization to increase competitiveness. The structural plan was formulated with an impulse to address the existing monopoly in the telecommunications sector which had rendered the industry uncompetitive (Gachagua 2004: 2). During the implementation of RTMPC, The Monopolies and Prices Commission (MPC) was established to implement and regulate competitive policy reforms in the industry. The MPC was mandated to develop a regulatory and market structure, market conduct, enforcement and compliance of industry (RTMPC Act 1989). This commission faced a lot of challenges addressing how they would engage with other regulatory authorities such as CCK. Following this realization, GoK embarked on a restructuring process to ensure that the commission had more regulatory powers. The implementation to eliminate monopolies was enacted between 1996 – 1998 upon the adoption of a policy framework known as ‘Economic Reforms 1996-1998’. The reforms focused on eliminating monopolies and enhancing privatization of the state-owned monopolies (NISL 2012: 14). During this reform period of reforms, mobile cellular subscriptions (per 100 people) between 1995 and 2000 increased from 0.0074 to 0.405 respectively. Despite the structural reforms, mobile density in Kenya remained lower than in Ghana. Fixed telephone subscription per 100 people slightly increased from 0.8608 to 0.9275 in 1994 and 2000 respectively (See Table 9.) (World Bank 2018).
Table 8. A Summary of The Comparative Measures on Ghana and Kenya Telecommunication Performance

<table>
<thead>
<tr>
<th>Measures</th>
<th>Ghana</th>
<th>Kenya</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improving Teledensity</td>
<td>ADP 1991-2000</td>
<td>RMTPC 1988 elimination of monopoly</td>
</tr>
<tr>
<td>Elimination of monopoly and independent telecom operator</td>
<td>Established in 1993</td>
<td>Telkom established in 1998</td>
</tr>
<tr>
<td>First privatized operator</td>
<td>GP&amp;T separation to Ghana telecom and a second national operator in the rural area established in 1993</td>
<td>2000 Safaricom and Kencell</td>
</tr>
<tr>
<td>Operationalization of a rural firm</td>
<td>Implemented under ADP-2000 in 1993</td>
<td>Non-existent</td>
</tr>
<tr>
<td>Mobile services taxations</td>
<td>5% Levy on Mobile handsets</td>
<td>10% levy on mobile handset</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>Infrastructure variables</th>
<th>Ghana</th>
<th>Kenya</th>
<th>Ghana</th>
<th>Kenya</th>
<th>Ghana</th>
<th>Kenya</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Telephone Subscription per 100 people in Ghana</td>
<td>0.3062</td>
<td>0.8608</td>
<td>0.0204</td>
<td>0.0074</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed Telephone Subscription per 100 people in Kenya</td>
<td>0.3763</td>
<td>0.9377</td>
<td>0.0370</td>
<td>0.0083</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.4532</td>
<td>0.9478</td>
<td>0.0743</td>
<td>0.0100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.5993</td>
<td>0.9389</td>
<td>0.1242</td>
<td>0.0233</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.7396</td>
<td>0.9682</td>
<td>0.2315</td>
<td>0.0361</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.8597</td>
<td>0.9477</td>
<td>0.3790</td>
<td>0.0776</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.1222</td>
<td>0.9275</td>
<td>0.6867</td>
<td>0.4050</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.3. New Entrants and Mobile Technology Change and Development

Liberalization of the telecommunications industry increases the number of entrants in the market. This determines the profitability and successful entry of a company to provide goods and services. In a scenario whereby; a firm makes a late entry, the comparative results between the earlier entrant and late entrant will yield different results such as, the number of mobile cellular subscription per firm, telecommunications infrastructure investment and penetration rate in both rural and urban areas. Therefore, the timing of entry in each market is important to propel a faster growth of the industry (Lillien and Yoon 1990: 569-571).

5.4. New Entrants in Ghana’s and Kenya’s Telecommunications industry

The process of privatization and de-regulation eliminates monopolies and creates a conducive environment for new entrants. Deregulation of industry in Ghana attracted investors due to elimination of barriers such as tax reductions, elimination of bureaucratic processes, reduced risks of operations and potential returns. “Regulatory risk not only impacts on the level and timing of investments but also the total costs of running a mobile operator” (Nanevie 2012: 47).

In Ghana’s case, the GoG in the process of reforming the industry, sent invitation for bids in the early 1990’s for a new cellular network operator. In 1993, Milicom Ghana had successfully bid as the first private firm to begin operations for cellular services in Ghana. Currently known as Tigo, the firm grew to 22,000 subscriptions in 1998 and a market share of 70% in that year. In 1991, Millicom Ghana implemented the ETAC System to provide cellular service across Ghana. In addition, operations in other parts of rural Ghana were established through installation of satellites in areas such as Kumasi and Tamale. In 1993, CellTell a new entrant in Ghana’s telecommunications industry brought a total of two privatised cellular providers. This operator systems utilized the AMPS services and focussed on a different location where Millicom had not started its operations such as Accra and Tema (see table 9.) (Nayo 2001: 9).

In 1996, NCA was established and mandated to grant licenses to telecommunication operators. In the same year, Scancom began its operations in Ghana providing the GSM 900 technology after paying a licensing fee to NCA. At that time, GP&T was providing cellular services such as voice calls and international calls. By 1996, ISPs increased to three providing their own satellite connection which enabled them to introduce competitive prices compared to Ghana Telecom (Foster et al. 2004: 3). In Kenya, the provision of internet services was illegal and became accessible in 1999 in the government officers, universities and NGO’s (Mureithi n.d.: 27). Prior to 1999, Kenya’s telecommunications industry was monopolistic and uncompetitive given that the only telecommunications operator at the time was one and owned and controlled by the Government of Kenya (GoK) under the brolly of Telkom Kenya. In 1997, GoK introduced structural reforms in the telecommunications industry to allow for competitive reforms from a
monopolistic sector to a liberalised industry. These reforms were based on reducing the
government functions and control while addressing regulatory, a working environment, sector
liberalization. Prior to these reforms, Telkom Kenya was mandated to source capitalize on fiscal
resources from potential investors for expansion to the rural areas where network was still a
challenge the sector continued to record low growth rate at 3.5% annually, poor cellular and
internet connectivity was extensive. Between 2000 and 2016, Kencell rebranded to Celtel
Kenya which was later sold to Zain a Kuwait based telecom. In 2011, Zain sold to Bharti Airtel
(EPZ 2015; Beauchesne et al. 2014: 7-9).

Subsequently, Ghana Telkom also established a subsidiary cellular operator known as Westel
which undergoing structural transformations to provide GSM services. Upon full de-regulation
of the sector in early 1990’s Ghana had 4 MNOs operating. Over the years this number
increased to 5 (See figure 8). The number of fixed pay phones increased from 25 in 1993 to
4000 in 2001 (i.e. 287%). Compared to SSA, Ghana’s teledensity was growing faster since it
grew by 66% in the same time frame. This performance is attributed to the process of
privatization and structural reforms that began implementation in 1990’s (Haggarty et al.
2003).

Table 10. Summary of New Entrants in Kenya And Ghana Between 1990-1999 And 2000 -
2016

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana</td>
<td>Millicom (Tigo), subsidiary of Milicom International, CellTell Ghana, Westel second national operator, Scancom</td>
<td>Glo, Expresso, Airtel, Vodafone</td>
<td>Voice call both local and international, SMS and mobile money services.</td>
</tr>
<tr>
<td>Kenya</td>
<td>none</td>
<td>Safaricom PLC ltd (Majority shareholder Vodafone), Kencell rebranded to Celtel, The later was sold to Celtel Kenya, then rebranded to Zain Kenya, Currently Bharti Airtel in 2011 to date Essar Group</td>
<td>Voice calls local and international, data services, SMS, mobile money services</td>
</tr>
</tbody>
</table>
5.5. Conclusion

Kenya’s Mobile subscription is higher than a most of the SSA countries. However, comparing to Ghana, mobile subscription per 100 persons has rapidly increased in a span of one decade. This means that the rate of ownership is higher to that in Kenya. Currently, Ghana has a higher mobile penetration rate at 67% compared to Kenya’s 57% mobile penetration rate (GSMA 2017). In Africa, Ghana still lags in innovative mobile technologies and start-ups in mobile industries compared to Kenya (CapitalFM 2018).

While analysing the market share between Ghana and Kenya, there are two dominant players in the market respectively. Nonetheless, the gap between the leading mobile operator and the second largest on Ghana is lower (between 47.8% and 23.78% voice subscription) compared to that of Kenya with 71.2% and 17.6% (NCA n.d.; CAK 2016/2017). In Ghana, Scancom has 47.8% share of the entire market while Kenya’s dominant operator has a 67.4% market share. The wide market share gap between Safaricom and Airtel is attributed to the sophisticated telecommunication infrastructure that is accessible in 80% of the country compared to the other operators. Moreover, the quality of products and services are attributed to Safaricom’s success (TFS n.d.). Network operators who enter a market earlier than the rest have a significant competitive advantage. They can increase their market share through provision of innovative services which increase barriers for new entrants. In hindsight we can say that “the attainability of market share is closely concentrated by market concentration” (Boniecki et al. 2016: 19). Therefore, infrastructure sharing is a crucial element for leveraging competitiveness in order to reduce costs for new entrants. This role is mandatory for the statutory bodies that regulate the industry (Boniecki et al. 2016:19-18).
Chapter 6. Conclusion

6.1. Conclusion

The main research question examines under which conditions can the communications sector contribute to development. The study found out that telecommunications industry thrives under a liberalized industry which creates opportunities for new entrants, increased competition. Investing in telecommunications infrastructure improves mobile accessibility and improved quality of products and services. Further, the dynamism of mobile technological progress is confined within the tenets of ‘creative destruction’ through progressive innovation (Laino 2011: 2). Evidently, the innovation process and policy frameworks and strategies entail cooperation between institutions such as the government, antitrust, regulatory bodies to formulate relevant policies to improve the industry.

While examining the sub-research question, the study sought to answer whether the mobile industry is important for Development. From the existing literature, there significant best practices examples in Sub-Sahara Africa, that demonstrate the importance of mobile technology to promoting growth and economic development. In Ghana and Kenya, mobile technology has been used to develop Mobile apps to provide information and to improve access to information on health issues on child health care and maternal health. In other parts of SSA, such Niger, mobile phones were useful to farmers seeking to seeking markets for their produce. This reduced transaction costs and eliminated time wastage and food wastage, thus increasing their returns.

How can the government stimulate the telecommunications industry? To answer this question, the research assessed existing literature to identify various ways with which the government has stimulated the mobile industry. In line with this study, the government stimulates the telecommunications industry by formulating relevant policies such the telecommunications infrastructure sharing framework, establishment of competition policy laws and institutional and legal frameworks that govern the industry. The institutional theory implicates institutionalism to formulating policies.

The research also examines why Ghana performed better than Kenya in mobile telecommunication density. The analysis established an interesting pattern and trend in mobile industry growth and innovation. In addition, while Ghana is performing better in teledensity (i.e. rapid mobile cellular subscription growth per 100 people and individuals using the internet percent population), Kenya is leading in mobile innovation. Using a comparative tracing approach, the study was able to identify the ‘intervening variables’ that implicate this performance. Therefore, through a process of tracing, the study was able to observe the probable explanations to this rapid performance (Bennet 2004: 22).
Ghana performed better than Kenya due to the institutional changes. This is attributed to the speed of implementing the reforms such as ADP-2000 between 1994 and 2000. Between this period Ghana experienced entry of new competitors who were the drivers of mobile technology change. The tower sharing framework in Ghana contributed to the rapid expansion of mobile phones in the rural areas. In addition, GIFEC also management of the universal service fund independently contributed to the expansion of internet in rural areas. Nonetheless, these alone cannot explain the overperformance of Ghana in mobile cellular services (per 100 people) and individuals using internet (percent population). Kenya by contrast experienced a lengthy timeline to implement policies and reforms. Therefore, in this study there is a good reason to believe that Ghana’s performance was influenced by institutional reforms, and the speed of implementation of these reforms.

6.2. Policy Implications Recommendations for the Government of Kenya

Telecommunications infrastructure sharing is important for the industry’s performance. It increases mobile penetration and improves the quality of internet connectivity. Infrastructure sharing reduces the costs of operations for new telecommunication firms. Telecommunication companies such as Vodafone and Orange (Spain and UK) demonstrated that sharing telecommunications infrastructure reduced their cost of operations (ITU n.d.). In Ghana, the infrastructure sharing model has successfully eliminated infrastructure investment risks for MNO through third parties such as ‘Helios Tower Ghana, Eaton Towers and America Tower Company’ (Osei-Owusu and Henten 2017: 5-10).

The existence of telecommunications infrastructure sharing in Kenya remains elusive. Given the state of industry competition in Kenya, new entrants and ‘smaller players’ often face difficulties investing in telecommunications infrastructure which reduces competition (Kamau 2018). Therefore, the GoK should involve state and non-state actors to develop a mobile sharing framework to increase mobile technology access.

The Universal Service Fund has contributed to the expansion of the industry. To ensure that the funds are used accountably and effectively, an independent body with flexibility to adjust policies should exclusively run the fund (ITU 2013: 15). In Ghana, GIFEC is an independent body that runs the operations of the fund independently of the national regulator NCA. GIFEC improved the efficiency, accountability and transparency of the fund in expanding telecommunication services in rural areas (GSMA 2014: 14). In Kenya, the fund is under the CAK the national regulator in telecommunications. Therefore, separating the two institutions will be crucial to expand the capabilities of an independent institution. “A central oversight body has proved very helpful to many countries” (OECD n.d.: 4).
The following recommendations are important having identified gaps and opportunities for improvement. The following action points can be taken into consideration for increased subscription and affordable services.

The following recommendations to GoK are:

- Develop and implement a telecommunication infrastructure policy plan for MNOs.
- Establish a subsidiary of Telkom Kenya to operate in the rural and marginalized areas.
- Establish an independent body to manage USF.
- Involve the local communities in the development plans.
- Provide tax incentives to the companies seeking to operate in the underserved areas.
7. Reference


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