ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

COLLEGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF MANAGEMENT

EXECUTIVE MASTERS OF BUSINESS ADMINISTRATION (EMBA)

CHALLENGES AND OPPORTUNITIES OF MANAGING THE TELECOM SECTOR: THE CASE OF ETHIO TELECOM

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ETHIOPIA

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LIST OF ACRONYMS AND ABBREVIATIONS

1G First Generation wireless telephone technology

2G Second Generation wireless telephone technology

3G Third Generation mobile communications

4G Fourth Generation mobile communications

ET ethio telecom

ETC Ethiopian Telecommunication Corporation

GATS General Agreement on Trade in Services

GATT General Agreement on Tariffs and Trade

GDP Gross Domestic Product

GSM Global System for Mobile Communications

HSBB High Speed Broadband

ICT Information and Communications Technology

ISDN Integrated Services Digital Network

ISP Internet Service Provider

IT Information Technology

ITU International Telecommunications Union

LTE Long Term Evolution

MCIT Ministry of Communication and Information Technology

MCIT Ministry of Communication and Information Technology

MNO Mobile Network Operator

NBE National Bank of Ethiopia

R&D Research & Development

SMS Short Message Service

UK United Kingdom

WTO World Trade Organization

Abstract

Telecommunication is the transmission of information over significant distances to communicate. The strong development of telecommunication would help to improve efficiency of the economy and the country's competitiveness which promote economic and social development. Telecom will change the way humans work, play, and live. The International Telecommunications Union (ITU, 2015) reported that there are more in-use cell phones than there are people on the planet already. Continuous technical transformation and information waves of the past century have driven high growth in the telecom industry. However, telecom companies are facing challenges as well as opportunities in their business endeavor. Hence, the purpose of this research is to investigate and examine the challenges and opportunities of managing the telecom sector of Ethiopia, with particular focus on ethio telecom. The method employed in the research is qualitative research method. Data is collected from both primary and secondary sources using the techniques of in-depth interview, direct observation, document review and analysis. Accordingly, it is found out that technological advancement, and telecom fraud are among the major challenges and opportunities of Ethiopian Telecom Sector. Moreover, it is found out that WTO accession will create new opportunities and as well will impose new challenges to the telecommunications sector of Ethiopia. Hence, ethio telecom and the Government shall create strategic alliance and partnership with high technology companies around the World, implement a fraud management system that detect frauds before it happen and damage occurs, implement appropriate policies and strategies to avoid the risks and grasp the opportunities of joining WTO, and establish Research and Development Center of Telecom for sustained development of the Telecom Industry of Ethiopia.

Key Words: challenges and opportunities of telecom sector

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Appendices

Interview Question Guide

1. What are the Impacts of Globalization and the Risks and Opportunities it Present to the Telecom Industry in general, and in particular to Ethiopian Telecom Industry and ethio telecom?
2. What are the Impacts of Technological Advancement and the Risks and Opportunities it Present to the Telecom Industry in general, and in particular to Ethiopian Telecom Industry and ethio telecom?
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CHAPTER ONE: INTRODUCTION

1.1. Background of the Study

The 21st century comes with its own challenges and opportunities. The challenges include climate degradation, resource depletion, overpopulation, urbanization, citizens' demand for better standard of life, etc. The demand of human beings for better and sustainable living conditions while there is only limited natural resource, environmental degradation, and ever increasing population pose real challenge to humans in general. Government and Industry leaders are sandwiched between citizens' demands and these challenges. Governments must meet the 21st century citizen's expectations. Industries must reduce costs & maximize profits. Given the aging infrastructure and limited budget of governments, new and smart ways of doing things must be discovered to address these challenges. And this is where Telecom comes in (Anckar & D'Incau, 2002).

By exploiting the prospects of Telecom, humans can find new ways of working, playing, and living which can enable government and industry leaders meet both ends. The prospects of Telecom have even gone deeper with the advent of mobile phones. Today, mobile phones (both feature and smart phones) offer a better infrastructure for Telecom services. The mobile has even started to be considered as the 7th mass media after print, recordings, cinema, radio, TV, and the Internet. Moreover, the mobile phone brings unique benefits compared to the previous mass media (Cooper & Zmud, 1990).

Wolf (2004) stated that telecom will change the way humans work, play, and live. The International Telecommunications Union (ITU, 2015) reported that there are more in-use cell phones than there are people on the planet already. Similarly, Silicon India recently reported that the number of active cell phones will reach 7.3 billion by 2014. This means that the mobile phone has penetrated and is still penetrating more than any technological product. The mobile phone now offers an infrastructure or platform where humans can do whatever they used to do

in the physical world. Common activities that are performed in the physical world, for example, learning, shopping, governing can all be performed now using the mobile infrastructure. When these activities are done through the mobile platform, there will be an unprecedented efficiency in resource utilization. This capability is sure to revolutionize the way people work, play, and live.

Telecom will diminish geographic boundaries and bring people into one platform. Geographic boundaries will not have significance in terms of work habits. People from every corner of the world will be able to share and access data in all walks of life. This creates a massive amount of data referred to as the big data. By analyzing the big data using data mining technologies, it will be possible to find out patterns and trends in the way people work and live. This, in turn, enables us to Telecom the future and so prepare accordingly in terms of infrastructures and services. All this efficiency and comfort comes with the revolution of Telecom (Wolf, 2004).

However, following the exponential growth in the telecommunications sector in the end of the past century, the telecommunications operator's faces different challenges, including challenges of telecom fraud. It is estimated that telecommunications sectorloses several billion dollars per year due to a wide variety of frauds. In China, it is reported that the losses amounted to 20 billion RMB YUAN in 2001 for telecommunications frauds. As for the situation in western countries, it is estimated that the revenue losses total 3% to 6% annually depending on specific services and varying in time (Communications fraud control association, 2003). Ethio telecom is not an exception to this problem of telecom fraud, monthly it loses 17% - 20% of its monthly income due to telecom fraud (Ethio telecom, 2013).

Hence, the whole purpose of the research is to investigate challenges and opportunities of managing telecom sector of Ethiopia, with particular focus on ethio telecom.

1.2. Statement of the Problem

Continuous technical transformation and information waves of the past century have driven high growth in the telecom industry. However, an age with saturated telecom penetration is coming, and telecom industry and companies are facing challenges as well as opportunities in their business. Looking to the next decade, telecom industry and companies need to adapt itself to the requirements of the new age in the changed environment, and manage the challenges and maximize the opportunities of globalization, technological advancement, telecom fraud, and so on. In case of ethio telecom, following the growth in the telecommunications, it is observed that ethio telecom face a new operational challenges: telecom fraud (ethio telecom, 2015). In addition, the 2014, 2015 and 2016 quarterly and semi-annual reports (and as well the 2014& 2015 annual reports) of ethio telecom showed that, now a days, telecom fraud detection and prevention remains a challenge for ethio telecom, and fraudsters are continuously evolve and create new ways to exploit weaknesses in its internal controls. The 2015 yearly performance report of ethio telecom showed that due to telecom fraud ethio telecom lose 17% to 20% of its monthly income, it faces damage of the telecom infrastructure, its quality of service negatively affected as some sites are congested due to SIM Boxes which usually consumes considerable amount of voice bandwidth and signaling & results increased call failure rate, service unavailability, disturbance and much longer waiting times to connect a call (Ethio telecom: 2013). On the other hand it is observed that the Government give due attention and commitment for the development of the telecom sector. For example, currently it underway telecom expansion program, through vendor financing, to expand telecommunication infrastructure and service delivery in order to foster socio-economic development of the nation and as well to reach telecom services for rural and remote areas of the Country. This will increase the number of telecom service subscribers and level of penetration, which is an opportunity for ethio telecom. In addition, if Ethiopia becomes member of WTO it will give its opportunities and challenges that may put a profound impact on Ethiopia's telecommunications development.

Hence, it is very important to detect and manage the challenges and grasp the opportunities to develop the telecommunications sector of Ethiopia.

Thus, this research intends to examine challenges and opportunities of managing telecom sector of Ethiopia, with particular focus on ethio telecom. The researcher became interested to study on this issue due to the fact that there is no previous similar research on ethio telecom based on the stated research topic. Hence, the research will add some knowledge on the area and will give some input for ethio telecom to address the issues strategically.

1.3. The Research Questions

The following research questions of the study will be formulated to investigate:

1. What are the challenges and opportunities of technological advancement to ethio telecom?
2. What are the expected challenges and opportunities of Ethiopian Telecommunication Sector, if Ethiopia joins WTO?
3. What are the causes and management systems of telecom fraud in Ethio Telecom?

1.4. Objectives of the Research

The general objective of the research is to investigate and examine the challenges and opportunities of managing the telecom sector of Ethiopia, with particular focus on ethio telecom, and forward viable recommendation based on the research findings.

The specific objectives are:

1. To analyze the challenges and opportunities of technological advancement to ethio telecom.
2. To analyze the expected challenges and opportunities of Ethiopian Telecommunication Sector, if Ethiopia joins WTO.

3. To analyze the major causes and management systems of telecom fraud in Ethio Telecom.
4. To suggest possible recommendations that should be taken by the Government and ethio telecom to utilize the opportunities and mitigate the impact of the challenges.

1.5. Scope and Delimitation of the Research

The researcher conducted in-depth interview with selected interviewees from ethio telecom, ZTE, Huawei, and Ericsson and made direct observation at ethio telecom Head office. The study would be more meaningful if it includes all the stakeholders, like the Ministry of Communication and Information Technology, the Board of Directors of ethio telecom, Customers of ethio telecom, and so on. However, the researcher could not be able to do that due to time and other resource constraints.

1.6. Significance of the Research

It is hoped that the research will give an insight on challenges and opportunities of Managing Telecom Sector. Moreover, it will be used as a reference material for students who are interested in the area of Telecom sector Management. In addition to these, the result of the research may serve as a springboard for further researches with wider scope and in-depth analysis on the same or related topic.

1.7. Organization of the Research

The thesis is organized into Five chapters as follows. The first chapter is the introductory part. Chapter two deals with literature review. Chapter three presents research design and methodology. Chapter four, which is the major part of the study, focuses on data analysis and interpretation. These are followed by the final chapter, chapter five, conclusion and recommendation of the paper.

CHAPTER TWO: LITERATURE REVIEW

2.1 What is Telecommunication?

Communications technology is often used as an extended synonym for information technology , but is a more specific term that stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage, and audio-visual systems, which enable users to access, store, transmit, and manipulate information (Accenture, 2010).

The term telecommunication is also used to refer to the convergence of audio-visual and telephone networks with computer networks through a single cabling or link system. There are large economic incentives (huge cost savings due to elimination of the telephone network) to merge the telephone network with the computer network system using a single unified system of cabling, signal distribution and management (Anckar and D'Incau, 2002).

In today's telecommunication industry, physical network elements are continually evolving and merging with each other. Greater consideration of user experience represents an advance in smart terminals and network technologies in the mobile telecommunication industry. Telecommunication will provide much better user experience and makes further convergence and innovation possible in terms of terminals, wireless network and services. Telecommunication will revolutionize information perception, acquisition, participation, and control. Telecommunication services will expand to include more enterprise users. A Telecommunication network will leverage the excellent features of a LAN and cellular network; it will become smarter and friendlier and serve a broader range of purposes. It will penetrate all aspects of life and coexist with other successful technologies (IBM, 2010).

2.2 Trends of the Global Telecommunications Industry

The global telecommunications sectorwas once country-centered, regulated and monopolized by Governments. However, nowadays the industry has witnessed dramatic changes due to globalization, changes in market structure, technological advances and regulatory practices (Curwen & Whalley 2008; IBM 2010; Kagan 2010; Ernst & Young 2012; McKinsey 2012).

During its early stages of development, most countries treated the telecommunications sectoras a public good (Leff, 1984; Pennings, Vankranenburg & Hagedoorn, 2005). The situation has since changed; triggered by the forces of globalization, regulatory developments, technology advancements and consumer demand. Consequently, the industry is now characterized by intense competition and industry players are reviewing their positions and participation in the value network (Bain & Company 2010; ITU 2011; McKinsey 2012).

Another factor is market liberalization; fuelled by the WTO. The consequential easing of the barriers of entry (Porter 1995) led to telecommunications firms in developed countries penetrating international markets. This has changed the telecommunications landscape (Contractor & Lorange 2002; Accenture 2010; Deloitte; 2012; McKinsey 2012).

The transition of analogue to digital technologies, along with convergence and integration of information and media, including the internet, broadband, mobile and wireless communications, have challenged the traditional telecommunications business The shift from traditional services to next generation networks, wireless, Voice over Internet Protocol (VOIP), media and social networking has led to the rapid adoption of mobile communications in developing countries. This medium is creating new business imperatives for telecommunications providers (Jamison 2001; Bain & Company 2010; BMI 2012).

The acceleration of digitization is an economic driver for growth and is leading to commoditization of telecommunications services. Firms face challenges with operational

efficiency and achieving sustainable growth (Booz 2012). With ongoing economic market uncertainty, firms are shifting from integrated to open business models to leverage on opportunities in the marketplace and digitization can play an important role in assisting policymakers to spur economic growth and employment. The trends and forces are blurring the ecosystem and industry players are reviewing their positions and participation in the value network ((IBM 2011). This challenge implies that telecommunications firms have to shift their focus from technology to the customers (Roland Berger, 2012, p.14). They have to give more emphasis to the usage and the users of new technologies - segmented by education, income, age and gender – that now emphasize the shift from voice to data traffic.

The ITU (2012) reports that the mobile sector is leading the way with an estimated 6 billion subscriptions worldwide. Consumer demand for data has spurred 3G growth which reached an estimated 1.5 billion subscribers in 2012 (mobithinking.com, 2012). Much of this demand is from Asia which accounts for over 50% of global mobile subscriptions with China and India accounting for majority of growth. Customer needs and expectations for data services is driving technology developments. The growth of mobile devices and connectivity has fuelled the evolution of the wireless sector which is predicted to be the fastest growth sector expected to reach $796.2 billion by 2013 (Kagan, 2011). However, the fixed, wireline segment on a downward trend, declined from 1.27 billion at the end of 2008 to below 1.2 billion in 2010 (Datamonitor, 2010; ITU, 2010). Access to these services is underpinned by the infrastructure.

Network infrastructure provides the backbone, transmission capacity and supports network services and access for operators. Traditionally viewed as core to the telco industry, the dynamic market landscape and driving forces are transforming the sector as operators review their business models and positions in the broader networked economy. While the transition to next generation networks, including, IP, web-based infrastructure and fiber to the home to meet communication needs across multiple channels presents opportunities, operators remain vulnerable to sustain competitive advantage in the dynamic landscape. These challenges are

forcing operators to review how they can combine their strategic assets and customer relationships and leverage their positions in the network value chain (Accenture, 2010; IBM, 2011; Deloitte, 2012).

To enhance competitive advantage, several models are emerging in the new economy. These include firms outsourcing their network assets and operations to free cash flow. Additionally many are entering into network sharing arrangements to reduce cost and manage capacity as well as forming partnerships with leading media and internet firms (Ibd). The major challenge remains achieving growth to meet consumer demand as convergence increases, whilst maintaining low cost structures (CIMI, 2011; Alcatel-Lucent, 2012).

Equipment suppliers meet telecommunications infrastructure needs as well as devices (Arthur, 2011). The devices sector is experiencing steady growth. There are three times as many phones in the world today as there are personal computers (CCS Insight, 2010). Growth is fuelled by smartphones which witnessed an increase of 63.1% increase in sales from 304 million in 2010 to 491 million in 2011 and reached over a billion as at Q3 2012 (IDC, 2011; mobithinking.com 2012). Deloitte (2011), estimate that the $100 smartphone reached its first half billion in 2011. As consumers engage in a mobile lifestyle, the sector has also witnessed an increase in tablet computers which grew from 10 million sales in 2010 to an estimated 50 million in 2011 (Ortega 2011). Due to competitive pressures and changing regulatory requirements suppliers are increasingly adopting innovative business models to achieve network efficiencies and fixed line infrastructure remains challenged by regulatory policy (Arthur, 2011).

Due to recessionary conditions in 2003 the market valuations of leading industry players plunged as borne out by Ericsson from US$115 billion to US$11 billion and Nortel from US$136 billion to US$8 billion in March 2003 (Curwen & Whalley, 2010). This led to restructuring and consolidation through mergers and acquisitions. Currently, Vodafone is a global market leader in respect of mobile networks. In respect of GSM the leaders are Ericsson

and NSN. As regards to CDMA Motorola, Nortel and Chinese vendors Huawei and ZTE are the market leaders (Curwen & Whalley, 2010).

Telecommunications services include both voice and data over mobile and fixed lines. While the internet remains a major force in today's business and social environment, it is the mobile and wireless sector which is leading the way. Worldwide mobile subscriptions reached an estimated 6 billion in 2012, equivalent to nearly 85% of the world's population, compared to 1.41 billion in 2003. China and India alone accounted for 30% of subscriptions in 2011 (ITU 2012). The forecast is for 7.3 billion mobile connections by 2015 Revenue from mobile data contributed as much as 25% to overall global mobile revenue in 2010 (Ovum, 2010; ITU 2011).

With mobile broadband demand increasing, there were an estimated 1.2 billion active mobile broadband subscribers in 2011 compared to an estimated 870 million in 2010 (ITU, 2011, 2012). Cloud computing continues to grow and services will be promoted through network appliances (CIMI Corp, 2012). The ITU (2010-2011) Trends in Telecommunications, contends that "Broadband is no longer a luxury, it is a necessity that will be crucial to every country's economic, political and social growth". Rise in smart devices is also set to spur mobile broadband growth.

Initially used for social purposes, the landscape for social media is evolving as more businesses are embracing these channels to reach out to consumers (Ventana Research, 2010). With the shift in social communication patterns, social networking sites like Facebook are estimated to have a billion subscribers as at the end of 2012 (socialmediatoday.com 2012). Twitter, with an estimated 250 million active users has 900 million registered profiles. Additionally, advertising, mobile payments and e- Government services are on the increase (Deloitte, 2012).

In general, telecommunication showed five technological trends which will be referred as milestones in the telecommunications sector: from analogue to digital, from telecom protocol (standard and proprietary) to internet protocol (IP), from Narrowband to Broadband, from

wireline to wireless (including cellular, mobile, microwave including WiMAX), and from Broadband (BIT Rates from domestic users 144kbs upwards) to high speed. Broadband (bit rates for domestic users up to 100mbs and 1GBs) is used for wired networks and 3G for wireless networks. Due to the convergence of telecommunications and media, the telecommunications sectoris often classified as part of the information, communications and technology (ICT) or technology, media and telecommunications sectors. The evolution of technology including the transition of analogue to digital technologies, and consumer behavior has led to the innovation of new mobile services. Technological advances have resulted in demand for narrowband to broadband and a surge in the use of IP.

In 2015 the global telecoms industry continues to grow from strength to strength. While the operators may struggle to grow significant revenues; the underlying trends of mobile broadband; M2M; Cloud computing; OTT services and Big Data management continue to propel the broader telecoms sector ahead. Fixed broadband is also making headway with the majority of countries now having a national broadband network plan or policy in place (Aharoni & Nachnomi, 2000).

Mobile penetration continues to vary widely throughout the world. In Europe, nearly 80% of the population were unique mobile subscribers at the end of 2014, while in Sub-Saharan Africa the figure was only 39%. But the developing regions are where we will see most growth in the years to 2020 (ALI, 2000).

Mobile broadband access using the 3G and now the 4G/LTE networks has continued to expand as users continue to add tablets, modems and phones to use alternative communication methods and cloud based services. In the longer term, with the increase in connected devices and the increased availability of mobile devices such as tablets and smart phones, the amount of mobile data downloaded is likely to at least double yearly for the next few years (Ibd).

The terms globalization and internationalization are often interchangeably used. However, authorities maintain that there are noteworthy differences between the two concepts (Daly, 1999). Walker and Fox (1996) view globalization as different things in different contexts. With increasing interdependence of national institutions and national economies, economic theorists suggest that globalization frees up capital flows (Floyd, 2001). The gradual lifting of trade barriers through GATT and WTO has enabled global geographical reach for firms. Similarly, globalization theory is the growing interdependence of national economics – involving consumers, producers, suppliers and governments in different countries (Dunning, 1997; Alam et al., 2010).

The globalization phenomenon became prevalent in the 1970's (Gjellerup, 2000) and was commonly used in the 1980's as efficient trade and financial flows were enabled by advances in technology (IMF 2008). As boundaries opened up, companies had to build partnerships and relationships to compete effectively describes globalization (Steger, 2009).

The rapid convergence of the world's economies and movement of capital flows has resulted in the blurring of industry boundaries and an increasingly complex landscape (Ernst & Young, 2010). These trends, which also present opportunities and challenges, require the industry and Governments to rethink and reshape their strategies to remain competitive in domestic and cross-border activities.

2.3 Innovation and Technological Development in Telecommunication Sector

The level of corporate technical innovation has increasingly become the key factors deciding the survival and sustainability of a corporation in a competing environment in which science and technology develops rapidly. The organizational boundary of the company has been obscured with the application of telecommunication. For a corporation, integration of corporate benefits dedicates the subordinate companies with a closer relationship of science and

technology and a higher level of technical innovation. Accordingly, assessment towards the subordinate company not only must reflect the characteristic of integration of corporate benefits and the interactional benefits amongst all subordinate companies, but also reflect the ripple effect promoted by the application of telecommunication.

The internet, now a major competitive force is altering the telecommunications landscape and is a catalyst for the technological developments required to meet consumer demands The convergence of technology, media, and telecommunications (TMT) combined with open IP networks, has led to an erosion of the barriers to entry (Deloitte, 2010; Mathews, 2010).

Consequently, the rise in smartphones and network appliances presents further opportunities for players to form alliances and bundle solutions with complements to increase revenue and market share in adjacent and related industries (Funk 2009; Deloitte 2012). Technological advances, however, require increased investments in R&D to bring new innovative products and services to the market. Related challenges are the reducing project life cycle times, positioning in the value network and the need for product differentiation to reap its attendant benefits in a highly competitive market (Laanti, 2009; Ernst & Young, 2010; IBM, 2012). Technology advances also present opportunities for market entry as well as increased capacity thereby increasing competition. This in turn impacts pricing, often resulting in price reductions (Roland Berger 2012).

2.4 Telecom Fraud and its Management

In the IP arena, the business model is quite different from traditional telephony services. The Internet and IP bring new business models involving several different actors. However, the business models imposed by this Internet-enabled environment indicate that roles and actors will be dynamic in nature. These actors include content providers, service providers, network operators, customers, but also fraudsters. Telecommunications fraudsters are organized criminals who deliberately plan to defraud or steal the telecommunications services (Bond and

Grasser, 1998). Furthermore, types of telecommunications frauds, in both wireless and wire line networks, can be divided into following three types: (1) technical frauds: such as pay phone or prepaid, tumbling and magic phones, PBX feature abuse, stolen credit cards or numbers, stolen or counterfeit handsets, clip-on, cloning or home and roaming, PRS fraud; (2) subscription frauds: e.g., accounting fraud, content sells, pre-paid fraud, call sells, eavesdropping, identity theft, SIM card cloning, IP fraud, bad debt, call forward, roaming; and (3) internal frauds: for instance, ghosting, telecommunications data theft, security breach of systems, commissions on fraudulent sales, unauthorized provisioning of services (Russell and Norvig, 1995).

In general, Telecommunication fraud has been a more and more attention-drawing problems, crossing all most all countries, developed and developing, eastern and western, in both industries and academia.

Telecom Fraud Management

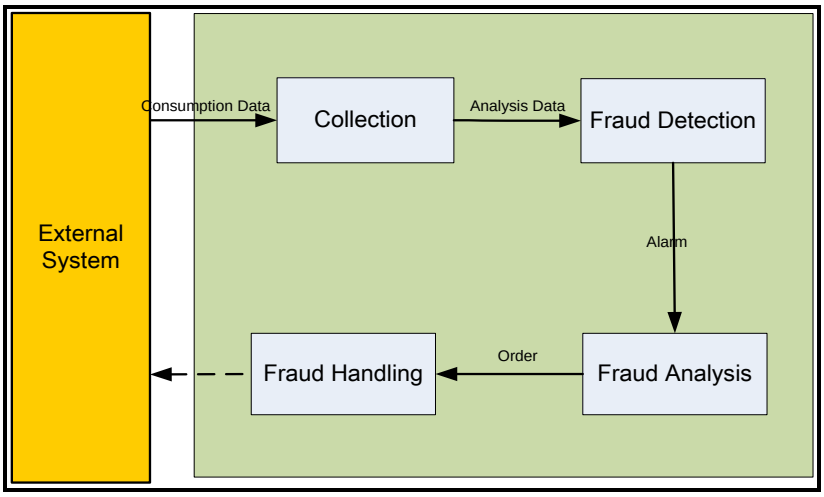


Figure 0-1 System Design Overview

Collection

Collection is the procedure to extract the data from external system, transform it, and then load it to the target database, in order to integrate the dispersed, disordered and non-unified data to provide unified data to fraud detection and fraud analysis.

Fraud detection

Paul (2001) stated that as for the detection and control of telecommunications frauds, with the advancement of telecommunications customers from the perspectives of technologies and services, fraudsters are getting more and more familiar with drawbacks and rips both at telecommunications technical side and administrative side. In other words, the fraudulent techniques and behaviors of_ telecommunications fraudsters are also dynamic changing with the evolution of telecommunications industry. The Author further stated that over the years, telecommunications operators have developed or acquired technology in order to identify fraud situations. This technology is based in a set of methods specifically designed to detect fraud. Some of the most common methods are:

High Usage - measure the amount of traffic generated by each SIM card; detect SIM cards that generate high amounts of traffic in the operators' network.

Calls collision - monitors the traffic in a time dimension for each SIM card; detect overlapped events generated by the same SIM card.

IMEI/IMSI stuffing - mapping the SIM cards (IMSI) to the devices, cell phones for instance, they are used in (IMEI); detect devices that use several SIM cards.

Call velocity - monitoring the traffic in a time and geographic dimensions for each SIM card; unlike the calls collision method, this method's gold is not to detect overlapped events, but physically impossible. For instance, the same SIM card has a call that ends at 2:00am in Braga

and another one that starts at 2:10am in Faro (more than 600Km away). Despite the events are not overlapped, it is physically impossible to travel the distance in 10 minutes.

Ratio - monitor the services used by each SIM card; detect SIM cards that use services (for instance: Voice, SMS, MMS, data) disproportionally.

It is the core component of Fraud Management System (FMS) which monitors various fraud behaviors through parsing the fraud scenes and logic described by fraud rules. The predefined rule based detection refers to configuring business rules to describe various known fraud behavior features and define the threshold, by which rule engine can carry out fraud detection on the subscribers' consumption data. When the business rule is violated, system creates alarms automatically.

In fraud detection platform, FMS manages all the risk data in fraud management field, including black list, hot list, and high risk country/area, at the same time the subscriber consumption profile management. It is also provided for the need of risk decision.

Fraud Analysis

Fraud analysis platform is concentrative analyzed platform based on unified presentation. It receives the alarm information generated from Fraud Detection, and matches the corresponding fraud types to present corresponding analysis information. In FMS, different fraud case corresponds to different analysis and processing flow. The first processing activity of all flows is fraud analysis. When alarm generates, system will generate flow instance according to flow template corresponding to the fraud case, and corresponding order is generated for the alarm, then the order is assigned to relevant analyst to analyze the alarm.

Fraud Handling

Fraud handling platform is the key to protect the benefit of carriers and customers. In FMS, different fraud cases determined different alarm processing flow, system generates flow

instances based on corresponding workflow template, flow engine will implement the dispatch in different platforms and departments. When flow enters each activity, work orders are generated according to configured work order template combined with order information. Work orders are executed in Workforce Management, which will dispatch the work orders based on dispatch rules. Email can be sent when work order arrives to inform executor to handle, and warning and alarm can be used to highlight for the executor when the work order is not finished in time exceeding the threshold.

Defining an approach

Burge, et al (1995) stated that, when a new fraudster is detected by the fraud solution, the profile will be used for: the identity features will be used to detect an attempt from the fraudster to re-enter the operator network; the behavior features will be used to detect other subscribers that have a similar behavior and therefore are likely to commit fraud. In order to solve the problem previously detected that affects the telecommunications operators, the following goals will be defined:-

1. Define a method that monitors the operator network traffic and builds profiles based on the SIM cards actual usage. These profiles are composed by identity and behavior attributes.

2. Define a method that monitors the operator network traffic and detects fraud suspects based on a behavior comparison using the behavior attributes of the profiles of fraudsters previously detected by the fraud solution.

3. Define a method that monitors the operator network traffic and detects previously blocked fraudsters attempting to re-enter the network, based on an identity comparison using the identity attributes of the profiles of fraudsters previously detected by the fraud solution.

4. Define a knowledge base structure, capable to support information retrieved from all the known fraud cases.

In general, with the emergence of large amount of new services, now a days the implementation of a package of solutions or fraud management system, new methodologies and technical means became a must for telecommunications operators to deal with varying telecom frauds beforehand and afterward. That is, the telecom operator should properly identify the causes of telecom fraud and the methods of detection in order to solve the problems of fraud using different methods, skills and knowledge in order to mitigate the impacts of it.

In addition, in today's fiercely competitive environment, developing strong customer relationships is the key to drive business success. However, in the case of telecom companies, it's one area where they have struggled and this affects their bottom line. To develop a strong bond with customers, it's crucial to offer superior service. To keep pace with the phenomenal growth of mobile communications, telecom companies needs to have invested a lot to develop cutting edge solutions for customers. A major challenge faced by service providers is to quickly roll out new technology and stay ahead of the competition. They also need to make sure that these solutions can be seamlessly integrated with the existing support ecosystem. With the rapid proliferation of mobile devices and apps, to meet user expectations, telecom companies need to optimize their network for better performance.

2.5 WTO Regulations for Telecommunications

2.5.1 Overview of General Agreement on Trade in Services (GATS)

The General Agreement on Trade in Services (GATS) is an annex to the Agreement Establishing the WTO concluded on April 15, 1994. It is a comprehensive legal framework which covers many service activities including telecommunications, finance, maritime, energy, business, education and environment and excluding "services supplied in the exercise of government authority". Unlike GATT which requires Members to accept the entire package of agreements, GATS requirements are based on a "positive list" approach in which Members only undertake specific commitments in the sectors that they listed in their schedules. According to the Article 10 of GATS, progressive liberalization is to be achieved through successive rounds of multilateral negotiations. However, Article XIX:2 provides that individual developing countries shall have appropriate flexibility for opening fewer sectors, liberalizing fewer types of transactions, progressively extend their market access in accordance with their development level.

GATS framework includes the following parts: Part I and II provide general rules and principles with respect to liberalization of trade in services. These parts cover all sectors and include (i) the most-favored nation treatment obligation (Article II); (ii) transparency (Article III); (iii) reduction and elimination of non-tariff barriers in domestic (GATS on Telecommunications, available at http://www.wto.org). regulations (Article IV); (iv) prevention of anti-competitive practices (Article VIII); and (v) obligations to developing countries (Article IV). Part III and IV of GATS provide a framework for the negotiations of specific market access commitments of individual members. These parts include (i) market access and (ii) national treatment obligations.

Both general obligations and specific commitments are subject to certain exceptions under GATS. Part V concerns about dispute settlement and enforcement of obligations.

Part VI covers definitional issues in the application of the GATS. In addition, there are Annexes on exemption from MFN treatment, movement of persons, financial services, telecommunications and air transport services as well as 8 Decisions concerning various aspects of implementation and interpretation of the GATS.

Defining four modes of supply is considered to be one of the most distinguishing features of GATS. The four modes are as follows:

Mode 1- Cross-border supply is defined as the supply of service from the territory of one member to that of another member. This is considered to be an important mode in telecommunications sector today because international calls from country to country fall into this mode.

Mode 2- Consumption abroad deals with the cases in which the customer of a member country goes to another member country to consume services. In the case of telecommunications, treated calling card services in some countries fall into this mode.

Mode 3- Commercial presence is defined as the supply of a service from one member's service supplier through commercial presence in territory of another member. This is considered to be the most important mode in telecommunications sector when many developed countries would like to establish branches in other countries to provide services or construct telecommunications infrastructure. Further liberalization in this mode is very significant for almost countries in telecommunications negotiations.

Mode 4- Movement of natural persons is defined as the supply of services by a supplier of one country in another country through the presence of natural persons. In telecommunications sector, a relevant case occurs when an employee of a telecommunications provider travels to another country to provide services.

2.5.2 General provisions

As mentioned above, the general obligations of GATS which are incorporated in the telecommunications sector include the following rules:

Article II- Most Favored Nation (MFN) Treatment: The Article II obligates WTO members to accord other members treatment no less favorable than that accorded to any other country. Therefore, if a Member engages in liberalization in a sector and extends a benefit to some of its trading partners, it must give the same treatment to all of its trading partners. However, Article II allows some exemptions to MFN treatment under the conditions which include (i) exemptions granted for more than 5 years shall be reviewed by the ouncil for Trade in Services; (ii) exemptions should not last for more than 10 years; and (iii) exemptions must be subject to future negotiations. Any exemptions must be approved under the waiver procedures according to Article IX:3 of the WTO Agreement.

Article III- Transparency: This article requires that all members provide publicly information on relevant rules and measures related to trade and investment in services. Firstly, WTO Members must publish all measures of general application relating to GATS. Secondly, WTO Members are required to inform the Council on Trade in Services periodically about their measures which affect trades in services. Thirdly, WTO Members must provide specific information on measures of general application under any request of other WTO Members.

Article VI- Domestic Regulation: This article requires that all members administrate the measures affecting trade in services in a reasonable, objective and impartial manner. In addition, necessary disciplines are to be developed to remove unnecessary barriers relating to qualification requirements and procedures, technical standards and licensing requirements. International standards and criteria for recognition should be established by the WTO Members.

Article VIII- Monopolies and Exclusive Service Providers: This article addresses the prevention of anti-competitive practices. It requires signatories to ensure that monopolies and other firms with market power do not act in a manner inconsistent with scheduled commitments.

Article IV- Obligations to developing countries: Developing countries are facilitated to strengthen their domestic service capacity, its efficiency and competitiveness; to improve their access to distribution channels and information networks; and to liberalize the market access in sectors and modes of supply of export interest to them. "Contact points" within two years from the date of entry into force of the WTO Agreement shall be established to facilitate the access of developing countries' service suppliers to information relating to their respective markets. In addition, Article IV mandates that special priority shall be given to the least-developed country members.

2.5.3 Specific commitments

Market access and national treatment obligation are the two important specific commitments of GATS. Unlike the general obligations, Members only have to undertake these specific commitments in case they make a positive commitment in their schedules of Specific Commitments in a particular sector. Market access: Article XVI of the GATS requires Members to permit other Members to provide services under all modes of supply according to the commitments they make in their schedules. Article XVII:2 addresses six types of limitations that Members shall not maintain unless specified in theirschedules. These include the limitations on: Number of services suppliers; total value of service transactions or assets; total number of service operations or quantity of service output; total number of natural persons that maybe employed in a service sector or on number of employees of a service suppliers; types of legal entities or joint ventures through which a service may be supplied and participation of foreign capital either in the form of caps on foreign shareholding or total value of individual or aggregate FDI in a particular service.

In telecommunications sector, the market access principle implies that Members must limit and qualify commitments on Mode 1 (cross-border supply) and Mode 3 (commercial presence). If a Member applies the types of limitations under Article XVI:2, it must specify and qualify them in its schedules.

National treatment: Article XVII of the GATS requires Member to treat the foreign suppliers at least as favorable as that applied to domestic suppliers in respect of measures affecting the supply of services. Under this Article, Members shall indicate the service sectors and modes of supply for which they apply national treatment in their schedules.

2.5.4 Exceptions

Under the Article XIV and Article XIV bis, GATS provides "general exceptions" and "security exceptions" which allows Members to deviate from their obligations under their commitments if the arising issues relate to national sovereignty or national security,public morals or public health, protection of human, animal or plant life or health, prevention of deceptive or fraudulent practices or dealing with effects of default on services contracts, protection of the privacy of individuals or safety. Besides, Article X and Article XII of GATS allow Members to apply safeguard measures in cases of emergency. Under Article XXVII, a Members have right to deny benefits of the GATS to the supply of services or service suppliers from non-Members.

In general, GATS commitment structure is voluntary and more flexible. Under GATS, members are free to decide which service sectors they wish to subject to market access and national treatment disciplines. Members can also specify in their schedules the limitations and exceptions they wish to maintain on market access and national treatment. Furthermore, market access and national treatment commitments can be made for each of the four modes of supply. These flexible features of GATS present both opportunities and challenges to developing countries in negotiations for services in general and telecommunications in particular.

In conclusion, the GATS provide a considerably flexible framework for the Members, especially developing countries. It neither forces developing countries to open up their entire telecommunications sector to foreign competition nor compels them to privatize and deregulate their telecommunications services. Members can select the activities and sub-sectors to commit. They can also choose the modes that they wish to commit on, the forms in which they make these commitments and the kinds of limitations or conditions as well as MFN exemptions. However, the Members should specify their schedules which show their decisions on which areas, to what extent, and under what conditions they decide to open their market to foreign direct investment. In telecommunications sector, there are some requirements that Members should commit. Among them, the important requirements include the separation between regulators and service providers, transparency, prohibition on anti-competitive subsidization and using information obtained from competitors with anti-competitive results. As a developing country, Ethiopia can choose the telecommunications sub-sectors, specific modes that it wishes to commit. The important point is that it should create greater transparency and improve its commitments in the sector through negotiations.

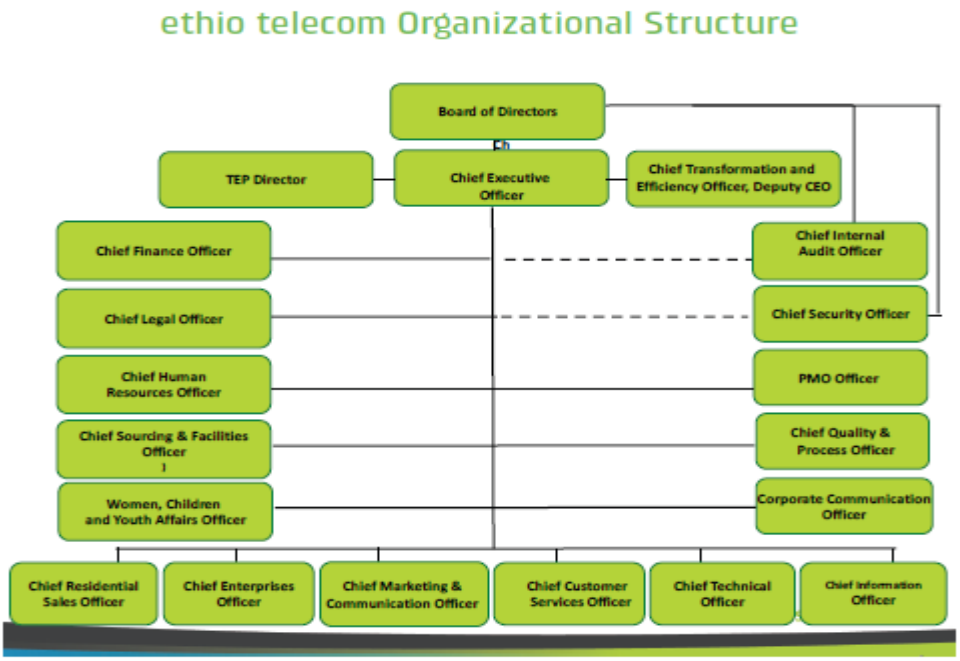
2.6 Ethio telecom

Ethiopia, which is located in the horn of Africa, is one of the oldest countries in history. However, for the first time, to pursue his vision of modernization, Emperor Minilik introduced and maintained Centralized Government structure and bureaucratic institutions (Mulugeta, 2005). In line with this, for the first time Telecommunications service was introduced in Ethiopia by Emperor Menelik II in 1894 when the construction of the telephone line from Harar to the capital city, Addis Ababa, was commenced. Then the interurban network was continued to expand satisfactorily in all other directions from the capital. Many important centers in the Empire were interconnected by lines, thus facilitating long distance communication with the assistants or operators at intermediate stations frequently acting as verbal human repeaters between the distant calling parties (Ethiopian Telecommunications Corporation, 2000). In the period 1894-1952, the telecom has been renamed and restructured through different stages and took over the running of Telephone, Telegraph and Radio communications of the whole country (Ethio telecom: 2014).

During the Imperial Regime, the Imperial Board of Telecommunications of Ethiopia (IBTE) was established with the main purpose to rehabilitate, extend, repair and maintain the telecommunication facilities of Ethiopia and to engage in the business of telecommunication for profit (Proclamation No. 131/1952: Art.5). By keeping and continuing this, during the Dergue regime, the telecommunication services had made a major change of technology ranging from Automatic to Digital technology (Ethiopian Telecommunications Corporation, 2000).

Under the Fedreal Democratic Republic of Ethiopia, the telecommunications sector was restructured and two separate independent entities namely the Ethiopian Telecommunications Authority (ETA) and the Ethiopian Telecommunications Corporation (ETC) were established by Proclamation (Proclamation No. 49/1996: Art.3). As a continuation of the 2005/06-2009/10

five-year plan, the Ethiopian Government has decided to focus on the improvement of telecommunication services by considering them as a key lever in the development of Ethiopia. Consequently, Ethio telecom is born on Monday 29th November 2010 from the ambition of supporting the steady growth of Ethiopia, within the Growth Transformation Plan (GTP), with ambitious objectives for 2015. Accordingly, ethio telecom organized as follows with the below stated visions, missions, objectives and goals (Ethio telecom: 2010).



Source: Ethio telecom

Ethio telecom Vision, Mission and Values

Vision

- To be a world-class telecommunications service provider.

Mission

- Connect every Ethiopian through Information Communication Technology.
- Provide telecommunication services and products that enhance the development of our Nation.
- Build reputable brand known for its customers' consideration.

• Build its managerial capability that enables ethio telecom to operate an international standard.

Values

• Be committed to understand, meet and exceed the telecommunications needs and expectations of the country at large and of customers in particular.

Respect

• Respect customers and recognize that their revenues allow ethio telecom to operate.

• Recognize the employees of ethio telecom as most valuable assets and create conducive working environment that allows them to develop and grow.

Excellence

• Be committed to high-level performances, customer service quality, organizational excellence and continuous improvement.

Integrity

• Be ethical and honest in all assignments.

Accountability

• Be accountable to all stakeholders.

Company Objectives

In line with its ambitious mission, ethio telecom has ambitious goals of:

• being a customer centric company

• offering the best Quality of Services

• meeting world-class standards

• building a financially sound company

To reach these goals, the Company focus on:

• developing and enhancing network and information system

• ensuring easy access and coverage to the whole population

• creating a strong brand

• developing human resources management

- implementing control standard processes
- improving financial, sourcing and facilities processes

Ethio telecom was managed, on a management contract arrangement from 2010 to 2013 June, by France Telecom, and was required to comply with Ethiopian Government orders. The Government said it outsourced the management as ETC was not able to meet the demands of the fast-growing country. It also said that telecommunications services would not be privatized, at least not in the near future. Ethio telecom generates a revenue of over US$ 300 million for the Ethiopian Government, and was dubbed a "cash cow" by the current Prime Minister Hailemariam Desalegn (ethio telecom, 2015).

The national operator, ethio telecom, provides fixed, mobile, Internet and value added services. In addition, it provides dialup Internet, CDMA 2000 wireless Internet, ADSL and wireless Internet using AIRONET, VSAT, and EVDO. It uses VSAT technology for the delivery of services to various Government networks such as WoredaNet, SchoolNet, AgriNet and to non-Government organizations. Furthermore, Ethio telecom provides other Value Added Services (VAS) such as Domain Name registration and management for the .et country code top-level domain (ccTLD), the Domain Name System (DNS), Web hosting, and Internet Protocol Address service. The resale of airtime vouchers and Internet services through cyber cafés is allowed for the private sector (ethio telecom, 2013). Currently the mobile network covers large area than any other network in Ethiopia. The current mobile penetration rate (the ratio of mobile line subscriptions to the total population) is 32.5%. And this coverage is expanding as a result of the continued telecom infrastructure expansion investments by ethio telecom, the sole operator in Ethiopia (Ibd).

CHAPTER THREE: RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

This Chapter presents the methodology selected for this research in order to answer the research questions and meet the objectives of the study. It describes the research methods, techniques and procedures that were used in conducting the research and to ensure the quality and validation of the findings.

3.2 Research Design

Research design is a frame or strategy, which guide a researcher when conducting a research study. As defined by Yin (2009:26), "Research design is a plan/procedure a researcher adopts that connects data to the study's initial research questions and its conclusion". Besides, Y.K Singh (2006) defined research design as an essentially statement of the object of the inquiry and the strategies for collecting the evidences, analyzing the evidences and reporting the findings.

The research design used in this study is descriptive in nature. Descriptive research is aimed at ascertaining, describing and seeks answers to the 'who', 'what', 'when', 'where' and 'how' questions and is helpful for explanation of phenomena as they naturally occur (Zikmund 2000). The outcomes of descriptive studies can assist in understanding of that situation and present ideas and information for further research (Malhotra 1996; Cavana, Delahye & Sekaran 2000). Accordingly, in this research it helps to understand and describe challenges and opportunities related to telecom sector management. The method employed in the research is qualitative research method and hence it involves the collection and analysis of qualitative data.

3.3 Target Population and Sampling Technique

3.3.1 Target Population

Neuman (2006) defines the target population as the 'the concretely specified large group of many cases from which a researcher draws a sample and to which results from a sample are generalized. Hence, the target population of this study was employees, supervisors, managers and top management members at different levels of ethio telecom, ZTE, Huawei, and Ericsson who are fully familiar with the range of issues in relation to challenges and opportunities of managing telecom sectorin general and ethio telecom in particular. Accordingly, the researcher selected interviewees from ethio telecom, ZTE, Huawei, and Ericsson based on their position in their respective company, and based on their knowledge about the topic in which the research is trying to investigate.

3.3.2 Sampling

When a study is conducted, it is not possible or necessary to collect the data from the entire population to draw conclusions. It is therefore important that a sample is drawn from the population based on the objectives of the study. A sample is a portion of population whose results can be generalized to the entire population for the particular study. Amin (2005:237) further described that a sampling is the process of extracting a portion of the population from which generalization of the findings can be made. Sampling is useful because it is more practical and economical. There are two main categories of sampling methods, namely, probability and non-probability sampling (Saunders, Lewis & Thornbill 2003 cited in Chew 2007).

In probability sampling, each member of the population has a chance to being selected into the sample, and hence it will reduce bias. However, it should be appropriate and suitable to the type and purpose the study (Ibd).

Non-probability sampling is preferred by qualitative researchers since the distribution of characteristics is not important, neither its relevance to the research topic. The types of non-probability sampling are:

Convenience Sampling: which is the most convenient method of collecting information from members of the population who are conveniently available. Members of the target population can be selected quickly. It is often used for qualitative research (Zikmund 2000; Davies 2005).

Judgmental or Purposive Sampling: it involves gathering information pertinent to the research from specific target groups (Cavana, Delahaye & Sekaran 2000). It involves a specific purpose in mind (Neuman 2006).

Quota Sampling: which involves the selection of predetermined categories to reflect the diversity of the target population (Neuman 2006). While it limits generalizability of the findings, it is necessary when a sub-set of population is under-represented in the target population (Davies 2005).

Snowball Sampling: is used when the characteristics of the desired sample is rare. It relies on initial participants referring additional subjects. While this sampling method can be low in cost, an element of bias exists and the cross section in the sample is likely to be limited (Neuman 2006).

Hence, in view of the nature of the investigation, the research used non probability sampling method of convenience, judgmental and snowball sampling to select the interviewees who are best suited and knowledgeable about the issues under investigation.

Accordingly, the researcher conducted in-depth interview with selected interviewees from ethio telecom, ZTE, Huawei, and Ericsson in order to collect relevant data in relation to the challenges and opportunities of telecom sector management and leadership in general, with particular attention to ethio telecom. The interviewees were selected based on their position in their respective company, and based on their knowledge about the topic in which the research is

trying to investigate. To keep the conversation focused, the research use an interview guide that contains key points which are covered in the interview. That is unstructured interview guide was prepared in order to give freedom and flexibility for the interviewees to talk about the issues and challenges of telecom sector management in general with particular emphasis on ethio telecom.

In general, guided by the research problem and the research objectives, the researcher selected on probability sampling for this research. As it was necessary to select individuals who were knowledgeable about challenges and opportunities of managing telecom sector in general with particular emphasis to ethio telecom, selection was based on relevance rather than representativeness. Taking into consideration time and cost constraints to obtain the large sample of data required, the researcher adopted a combination of convenience, judgmental and Snowball Sampling to reach specific target groups in order to collect relevant and pertinent information for the research.

3.4 Sources of Data

Data collection is the process of systematic gathering of information relevant to the aim and objectives of the study. Saunders, Lewis and Thornhill (2009:256) describe data collection as the gathering of information required to address the research problem. Kumar (2005:104) also stated that there are two major approaches used by researchers' namely primary and secondary data collection used to gather information depending on the availability of data.

3.4.1 Primary Data

In this study, the primary data sources to answer the research questions are unstructured open ended questions (Oates, 2006: 188- 222). The questions are prepared based on analysis of literature review. The selections of the interviewees is based on purposive sampling (Oates, 2006: 98). Purposive sampling is a non-probability sampling method in which the researcher uses his own judgement regarding the participants from whom information is collected.

Accordingly, the researcher select supervisors, managers and top management members to participate for interview using purposeful or judgmental sampling method. The interviewees are selected from ethio telecom, ZTE, Huawei, and Ericsson based on their position in their respective company, and based on their knowledge about the topic in which the research is trying to investigate.

The purpose of interviewing is what is in and on somebodies mind (Patton 2002). Qualitative research interviews seek to describe and comprehend central themes in the life world of subjects (Kvale 1996). Interviews have the potential to offer an access to a rich source of data (Silverman 2001) and are well suited for collecting comprehensive and valuable data from the target population (Cavana, Delahaye & Sekaran 2001). Researchers benefit from participants views and experiences as they probe to pursue in-depth information around a topic (McNamara 1999; Rubin & Rubin 2005; Fontana & Frey 2008). For these reasons, the researcher selected individual face-to-face interviews. The face-to-face interviews were held in the respective offices of the interview respondents or at a suitable hotel location. The duration of the interviews were wide ranging and lasted from an hour to two hours and the researcher took detailed notes during the interviews.

Unstructured interview guide was prepared in order to give freedom and flexibility for the interviewees. An interview guide used to increase reliability and credibility in the data collection (Eisenhardt 1989; Yin 1994; Perry 1998). It provided a level of environmental control and objectivity and retained objectivity while maintaining empathy and a personable demeanor (Hair et al. 2007).

Hence, as mentioned above, the research used an interview guide, that contains key points which were covered in the interview. This, interview guide helped to keep the conversation focused, give freedom and flexibility for the interviewees to talk about the challenges and opportunities of managing telecom sector in general with particular emphasis on ethio telecom,

permitting open dialogue, and flow in conversation. The researcher adhered strictly to the designed interview in order to retain objectivity while maintaining empathy.

The other method the researcher used to collect primary data is direct observation. To get direct information and to understand the overall challenges and opportunities of telecom sector management and leadership, the researcher made direct observation and analysis while he is carrying out his responsibility and duties as a staff and manager in ethio telecom. In addition, the researcher has got a number of chances to attend different workshops and conferences in relation to challenges and opportunities of telecom sector management and leadership. In each of these workshops and conferences, the researcher tries to observe and record the essential points in relation to the challenges and opportunities of telecom sector management and leadership. This helps the researcher to get a fuller understanding of the challenges and opportunities of telecom sector management and leadership and to substantiate the data collected through other data gathering tools. That is the advantage a researcher gets from observation for primary data collection is that, observation helps to collect firsthand information in a natural way. There is a chance to understand and interpret more accurately the data gathered through interviews and triangulate it.

3.4.2 Secondary Data

This part was mainly focuses on review and analysis of the previous 3 years performance evaluation report of ethio telecom (ethio telecom held every year a yearly performance evaluation meeting with all its employees, which is chaired by the Ministry. The meeting focuses on discussion of its performance, issues, challenges and opportunities of the company). The compiled report, which is the three years data collected and compiled from all the employees of the company, from this meeting of evaluation provide sufficient information and fuller understanding of the issues and challenges that the company faced while it is carry out its business. In addition, the last three years quarterly, semiannual and annual performance reports of ethio telecom, ITU reports, proclamations, regulations and rules of procedures related with

telecom sector management are analyzed. Moreover, both published and unpublished materials utilized in the course of writing the research.

Generally, secondary data of this study are compiled from different resources such as books, articles, websites, reports of ethio telecom, and other relevant materials and analyzed to deliver a fruitful and genuine study regarding the challenges and opportunities of telecom sector management.

3.5 Data Analysis and Presentation

Qualitative data consists of words not numbers and is a dynamic and intuitive process of inductive reasoning and theorising (Basit 2003; Neuman 2006). It involves translating words into meaningful information that can be interpreted. The qualitative data analysis process comprised the following sequential steps:

- Data Reduction: The first step of the qualitative data analysis process was to understand the information collected. Detailed notes from the interviews and the literature review were condensed and summarised to make sense of the information collected (Taylor-Powell & Renner 2003).

- Coding: The data was coded to identify themes and categories. The developed codes were then examined in terms of possible causes and consequences, conditions, and interactions to permit further analytic categories or concepts that cluster together (Neuman 2006).

- Content Analysis: The third stage was content analysis, including the examination of the content of interviews and the communicative medium (Neuman 2006). The objective of content analysis was to distinguish patterns in the display tables (Patton 1990; Cavana, Delahye & Sekaran 2000; Yin 2003).

- Conclusions: Finally, the themes between the categories were investigated for inducing conclusions.

Accordingly, all the data collected from interviewees and direct observations were summarized on a continuous basis to ensure completeness. The data were also be summarized, coded and presented in a way that communicates the major findings of the study. Collected data were categorized according to emerging variables from each question in the interview guide.

3.6 Ethical Considerations

Ethics is a system of moral values concerned with the degree to which research procedures adhere to professional, legal and social obligations of the participants. Therefore, ethical consideration in research should uphold fairness, honesty, openness, disclosure of methods, and the purpose for which the research is being carried out. The aspect of confidentiality will be given optimum attention. In this case, the identity of the participants will not be disclosed alongside guaranteeing them security for any complications.

In addition the research was conducted under close scrutiny in order to secure high quality and ethically appropriate research. Accordingly, the research conducted based on the following guiding ethical principles, which reflect the common standards, values and aspirations of the research community.

3.6.1 Autonomy

The researcher determine its own course of action in accordance with its own wishes and research plan. That is, it understood that autonomy underlies the need for informed consent.

3.6.2 Free and Informed Consent

The researcher ensured that there is informed consent which comprises information, voluntariness and comprehension of the respondents. That is, when providing information researcher ensured that participants are given sufficient detail about the nature of the research and the procedures involved. This will highlight the objectives of the study, potential risks and benefits.

3.6.3 Veracity

The researcher also believes that truthfulness is central to obtaining informed consent since, without this, participants will not exert their right to informed consent, justice or fairness.

3.6.4 Privacy and Confidentiality

Each participant were entitled to privacy and confidentiality both on ethical grounds and in terms of the protection of their personal and sensitive data. Each participant therefore has the freedom to decide the time, extent and circumstances under which they will withhold or share information.

3.6.5 Voluntary Participation

The researcher stressed that participation was purely voluntary with no offer of financial remuneration. The participant had the option to withdraw from the research at any time without explanation.

3.6.6 Integrity

The researcher undertook precautions to ensured that data was accurate and objective underpinned by scientific investigation.

3.6.7 Minimizing Harm (Non-malificence)

The researcher believes that research participants must not be subjected to any unnecessary risks of harm. Their participation in the research must be essential to achieving scientifically

the aims of the research and that cannot be achieved without the participation of these participants.

3.6.8 Maximizing Benefit (Beneficence)

The researcher understood and beliefs that the research must maximize net benefits. That is, it tried to ensure that the research is generating new knowledge that will produce benefits for ethio telecom, for the society as a whole, and for the advancement of knowledge.

In general, in order to meet the objectives and answer the research questions of it, the research used descriptive research method which helps to understand or describe the challenges and opportunities of managing telecom sector. The method employed in the research is qualitative research method. It involves the collection and analysis of qualitative data with an attempt to achieve a deeper and fuller understanding of a target phenomenon by verifying one set of findings against the other. It both primary and secondary sources of data. The data collection method includes in-depth interview, direct observation, and document review and analysis,.

CHAPTER FOUR: DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

Telecom is the fastest growing industry in the world as it is presented in the literature review part of this paper. In this chapter we will discuss the challenges and opportunities of ethio telecom in relation to technological advancement, WTO accession and Telecom Fraud.

4.2 The Impact of Technological Advancement and the Challenges and Opportunities it Present to ethio telecom

The responses of the interview, the observation of the researcher and the reports showed that technological advancement is one of the major factors which are influencing the telecommunication industry as a whole. Technological advancement in the recent times have dramatically changed the dynamics of players involved in the telecommunications infrastructure, equipment and services sectors and enabled the telecommunications sectortransports information at such incredible speeds that concept of virtual world has become true. Users can stay connected on a global scale without travelling and can collaborate in virtual world simplified by telecommunication industry, and hence Telecommunications has become tremendously important to successful operation of almost every organization around the world, large or small, in both the public and private sector and for most of the trans-border organizations it is the backbone of their business.

Respondents from Huawei, ZTE and Ericsson stated that advancements and innovations are being made in all sectors of telecommunications industry; wireless technology, internet, and satellite communications being the forerunners. So are changing the needs, demands and

expectations of global as well as ethio telecom customers. Hence, ethio telecom needs to keep pace by creating products and services meeting these demands. They also stated that satellites and optical fibers, among other technologies, contribute significantly to the globalization of telecommunications services. Standardization and interoperability of systems have become global issues.

It is observed that Telecommunications being an integral part of global communications network and critical for organizations as well as individuals has now become indispensable to socioeconomic activities. There is an increased focus on reliability and security of telecommunications and this has emerged as central and global issue. In current information age, information retrieval is gaining importance, while we still face challenges in terms of integrity and authenticity of the information to be provided, as well as the protection of privacy. Hence, addressing these diverse issues will be important for the future of Ethiopian telecommunication industry.

The respondents also stated that Telecom industry is investing heavily in innovation and technology development. The growth rate is continuing at a fast pace and new value added products and services are driving the consumer spending behavior. At the same time, technological advancement has dramatically changed the cast of players involved in the telecommunications infrastructure. It has grown from the original private and publicly owned telephone monopolies to include a host of new entrants such as competitive access providers, wireless carriers, value-added carriers, resellers and cable companies.

Therefore, ethio telecom need to operate using cutting-edge technological developments and should operate with leading industry where technology developments are taking place. Because, in the current decade globalization has already become a reality than a slogan and hence ethio telecom should position itself to exploit the opportunities and to reduce the impact of globalization through the use of growth and advancement that might occur in other countries.

4.3 Expected Challenges and Opportunities of Ethiopian Telecommunication Sector, if Ethiopia Joins WTO

Telecommunications Report of London Business Monitor (2015) stated that Ethiopia is one of the last countries in Africa allowing its national monopoly telecom company, ethio telecom, which is on all telecom services including fixed, mobile, internet and data communications. This monopolistic control has stifled innovation and retarded expansion. A recently expired management contract with France Telecom dramatically improved performance for ethio telecom though there remain weaknesses in quality of service. Although the contract was considered a first step towards privatization and the introduction of competition, the Government in 2013 again rejected calls to privatize the incumbent and allow market competition, citing the need for higher profits from the company to subsidies an unrelated railway project. Although there is considerable investment in telecoms services, the sector is heavily regulated and the Government has complete control over networks, with virtually unlimited access to the call records of all phone users and to logs of internet traffic. Most of the technologies deployed have been provided by ZTE and Huawei.

With a population of almost 90 million, Ethiopia is Africa's second most populous country. Although a number of major contracts have been signed with Chinese vendors since 2013, the country's mobile penetration remains one of the lowest in the world. Nevertheless, growth is strong and enormous growth potential remains. Albeit from a low base, mobile penetration is rising and the sector continues to benefit from the poor fixed-line infrastructure which has promoted mobile alternatives as the only viable, or robust, telecoms option in many areas.

In line with this, respondents from ethio telecom stated that nationally the attention and commitment given by the Government to expand telecommunication infrastructure and service delivery are very helpful to increase the number of subscribers and foster socio-economic development of the nation. In addition, this rapid telecom expansion, including rural and remote

areas, within a short period of time brought increase in number of telecom service subscribers and level of penetration.

In line with this, the respondents of the interview stated that Ethiopia's accession to the WTO will be a good opportunity to expand Ethiopia's telecommunications activities internationally and push up its development. Because, firstly, telecommunications liberalization will provide opportunities to attract foreign capital to improve telecommunications infrastructure that would help to improve efficiency of the economy as well as the country's competitiveness. Secondly, foreign investment also gives opportunities for Ethiopia's telecommunications sectorto receive modern technology transfer, to learn advanced experience in management. Those would lead to the development of telecommunications sectoritself. Thirdly, the fast change in technology and the move toward globalization of the telecommunications sectorwill put a positive impact on the effectiveness of state management. Lastly, Ethiopians consumers will benefit more from the telecommunications liberalization such as cheaper charges and better products and services.

However, the respondents also stated their concern if Ethiopia becomes a member WTO. i.e WTO accession will give not only opportunities but challenges and it will put a profound impact on Ethiopian telecommunications development. Hence, it is necessary to define the challenges to reduce the negative impact of joining the WTO. Some of the expected challenges are:

i. Challenges for reforming the legal framework and management at macro level:

Ethiopian Government needs to make its legal documents on telecommunications more compliant with the WTO agreements by revising and updating its laws. This will take time to make its legal framework for telecommunication to meet both its development goals and the requirements of the WTO regulations as it is remained monopoly in telecommunications sector for a very long time.

In order to utilize the opportunities and overcome the challenges in opening the telecommunications market, it requires not only wise policy makers, talent managers but competent employees in the sector. To improve the capacity of employees and local governments is also a challenge for manager in telecommunications sector.

ii. Challenges for harmonization between economic and social objectives:

Ethiopia's telecommunications sectorused to be controlled by the Goverment. Being a developing country, it is observed that the telecommunications services are even unfamiliar in many rural and remote areas, while the Government is always trying to make basic telecommunications services accessible and affordable to those people. That is the Government is responsible for developing infrastructure nationwide, including extending costly services to low-profit rural, mountainous and isolated areas but it will become an unfair and burdensome obligation for it if it liberalize the sector as foreign investors will rely on the existing infrastructure to reduce their capital costs and they may just invest in the profitable areas.

iii. Challenges for harmonization between development and security:

It will be a challenge for Ethiopia's telecommunications sectorto undertake full commitments in telecommunications liberalization with the WTO, at least in the near future. Being a country which is sensitive in politic aspect, furthermore, the national economy and security depend more and more on reliable and secure operation of information communication networks, Ethiopia needs to be more careful in opening its telecommunications sector. With greater liberalization and globalization of telecommunications networks, presence of foreign investors will increase the availability of telecommunications resources for all citizens, businesses and governmental organizations. However, it may be risky for domestic stability and national security because communications are vital to national security and the operation of the key industries. Foreign companies may install equipment and lines that Ethiopian authorities can not control. Telecommunications sectoris also an important means to maintain political and social stability

within the country and preserve the sovereignty of Ethiopia. Furthermore, the reach of global telecommunications networks may harm many industries' security. Cyber-crimes such as hacker, online back robber and terrorism become serious problems that Ethiopia may face.

iv. Shortage of capital and technology:

Shortage of capital will be one of the problems of ethio telecom to compute with international telecommunications corporations from developed countries. In telecommunications sector, a huge source of capital is necessary to build telecommunications infrastructure that will help them to provide better services. In addition, the foreign companies with large capital resource and experience usually pay much higher salaries to attract competent employees. This will also become a challenge that ethio telecom must find a solution. Besides the shortage of capital, ethio telecom will face the shortage of technology. Because of this weakness, the cost of services it will become high in comparing with that of foreign companies. This will also makes the competitiveness of ethio telecom weaker.

v. Shortage of qualified labor force:

The biggest domestic telecommunications enterprises in Ethiopia is ethio telecom which is a state-owned monopoly company. Compensation for the staff of state-owned enterprises will be lower than that of foreigners. This will leads to ethio telecom hardly have enough qualified staffs to compete with foreign counterparts.

In general, Ethiopia need more time to prepare for competition with foreigners. In addition, it is observed that telecommunications is a very sensitive sectors which affects all economy, political regime and social life. Hence, the government shall still remain its management over the telecom backbone of the telecommunications network in the at least for the near future to ensure security. In line with this, the Government shall improve competition in telecommunications market, firstly, by encouraging local companies to participate in

telecommunications business. The participation of new companies will promote competition in the industry. New companies will bring more financial sources into the industry and they can use it for infrastructure construction.

With new participation, the existing enterprises must try its best to compete with more competitors and keep its market share. In addition, Government should invest more in telecommunications sectorto construct and modernize telecommunications infrastructure. Infrastructure construction by the Government also helps to maintain the state control over the backbone of telecommunications network later, even when the foreign investors penetrate the market. Human resource is very important in knowledge-based economy and an industry cannot develop without strong human resource. In telecommunications industry, besides reforming recruitment policies to attract competent applicants, the Government should invest more on scholarship funds for potential employees as well as organize training programs.

In conclusion, WTO accession will create many new opportunities while impose new challenges to the telecommunications in Ethiopia. Competition will accelerate the development of telecommunication industry which will in turn positively influence on other aspects of both society and economy. Foreign participation in the telecommunications sector can help it to attract foreign investment and get international experience, however, it also give risks to Ethiopia's economy and political regime. Ethiopia should implement the appropriate policies to avoid the risks and grasp the opportunities to develop its telecommunications sectorin joining the WTO.

4.4 The causes and management systems of telecom fraud in Ethio Telecom

4.4.1 Telecom Fraud in etho telecom

The reports showed that telecom fraud is one of the serious challenge of the company. The interviewees from ethio telecom also stated that currently telecom fraud is a serious challenge of the company. However, they mention that, it is not possible to enumerate completely and exhaustively all the existing fraud types, due to the fact of constant evolution of technology fraud types are adapted and new fraud types are developed all the time. But, they mention that Subscription fraud, Bypass, SIM cloning and Internal Frauds are the major frauds in ethio telecom.

Subscription fraud - the fraudster obtains the service from the operator with no intention to pay for it, using a false identity. The damage this fraud type causes depends on the intention of the fraudster: using the service for personal use until he/she is detected; on a more sophisticated level, the fraudster can use the service in order to profit from the use of it.

Bypass fraud - deprives the terminating operator of interconnect termination fees for incoming international calls. This is usually done using Voice Over IP (VoIP) technology to bypass international calls.

SIM cloning - a fraudster clones an existing normal SIM card. The software to clone SIM cards is available on the internet, so if a fraudster has physical access to a SIM card all he needs to clone it is a PC and a card reader. This is considered the most common fraud cause of all.

Internal fraud - implies action of internal staffs of ethio telecom. Employees with knowledge and access to the information systems, handle information in order to benefit a third party; for instance giving free minutes, changing account settings, etc.

In general, telecom fraud has become one of the major challenges for ethio telecom. Ethio telecom knows that fraud cannot be completely eradicated. The solution to deal with this

problem is to minimize the damages and cut down losses by detecting fraud situations as early as possible. Hence, ethio telecom should properly identify the types and causes of telecom frauds it faced and its causes in order to mitigate the impacts of it.

4.4.2 Telecom Fraud Management in ethio telecom Infrastructure

It is observed that Fraud Management System (FMS) is a common platform and infrastructure to communicate and manage frauds in ethio telecom. It includes System Management, Business Process Management (BPM), Unified Interface Platform (UIP), Message Management and Log Management.

System Management

FMS provides functionalities for Staff list, position configuration and access right definition using system management function.

Business Process Management(BPM)

BPM is the core workflow engine which manages the business process flow to support Service Provisioning and Service Assurance.

BPM provides tools for Operator to define Business Process Flow Template which specifies the Activities included in the Business Flow and how they are combined and coordinated to complete the requested tasks.

Unified Interface Platform

UIP provides FMS a unified interface of connecting with external systems, and the following common protocols will be supported: Socket, COM, CORBA, Database dB link, SOAP, SNMP, HTTP, FTP, SFTP.

Message Management

Message Management provides a common set of functionalities to handle messages received from different modules in FMS system and send them to the receivers via E-mail, Web, or SMS.

Log Management

The mechanism of log is to record the user operation history. FMS shall collect operation log information from all interfacing systems or from centralized system like UAC/ SOC. And FMS provide function to support the following log query:

- FMS logs
- CBS logs
- SMS logs
- VC logs
- And others which will be defined during FRS and LLD

In addition, it is observed that in the Fraud Management System (FMS) of ethio telecom fraud detection module is the core module, which includes fraud detection, basic data definition, fraud scenario definition and fraud detection engine.

Fraud detection basic data is a deposited data of the fraud detection, including analysis data source, analysis object, and reference object, and rule components.

The fraud scenario definition is to establish the mapping relation between the business characters and rule, rule sets in the system, which also means to establish fraud detection model (the rules every time set by security department of ethio telecom).

The fraud detection engine loads the analysis data and then compares them with fraud detection rules. Alarm would be generated if there is a validation; the whole process would display graphically. The rule maintenance provides functionality to maintain all rules in the system quickly.

Reference Data Management

The reference data in FMS is divided into *risk data and the common* data. The *risk data* includes hotlist information, blacklist information, white list information, high-risk area information and lifestyle profile information. The risk data is kind of special reference data, besides aided analysis and pattern matching, it could be delivered to the external system as business risk data for interaction. The *common data* in the system includes holiday information, which is only used in the inner system for aided analysis and pattern matching.

Alarm Handling Management

Alarm Handling Management module realize the flow management to the alarm analysis and handling by flow mechanism. Alarm Handling Management includes task dispatching rules definition, alarm handling monitoring and task handling. After defining the alarm analysis and handling process, the handler could define the task dispatching rules to realize the auto dispatching of the job and authority control. Alarm handling monitoring enable users query all the alarms generated from the system and monitor the handling state graphically. Task handling means the alarm handling center. The system shows the analysis information in detail and the activity handling information by work order. The work order helps to realize the flow management. When the behavior is confirmed to be fraud, it will be archived automatically.

Fraud Pattern Management

Fraud pattern management module manages fraud patterns which are identified by data mining technique. Every data mining model deployed in system will be taken as a pattern in this

module. System builds mapping between fraud pattern and fraud rule, and provides unified management center for abnormal alarm which comes from fraud pattern.

Fraud Case Repository Management

When the alarm is confirmed to be fraud, FMS would automatically archive the information related to the fraud on basis of the fraud scenario and generate a fraud case. A fraud case records the information in a fraud activity into a repository for centralized management in order to provide supports to analysts.

Collection Management

Collection Management is the whole process that handles the data which come from data source systems. Collection Management extracts business data from application systems to Data Warehouse in the specific period. The Collection Management load phase uses a serial of program to load the cleaned data into FMS Data Warehouse according to the pre-defined data model.

These methods are implemented and thresholds are set by security department and analysis performed by the specialists/analyst. The method continually monitoring the network traffic and keep statistics for a given time period. If the threshold is reached, a possible fraud situation is detected. Then the analysts decide on each situation if this is a real fraud situation and what actions to take.

However, it is observed and the interviewees from ethio telecom stated that the fraud is detected after all the damage has already been done. That is, the methods to detect fraud that currently exist in ethio telecom is reaction-based; it can only detect a fraud after it has already happen.

Another issue the intervieewes mentioned in the fraud detection system of ethio telecom is lack of proper knowledge base and skill to handle the system. They mention that because of the

complexity of the system, it is complex to find a structure that stores all the fraud situations previously detected.

In general, it is not possible to enumerate completely and exhaustively all the existing fraud types in ethio telecom. Due to the constant evolution of technology existing fraud types are adapted and new fraud types are developed all the time. However, Subscription fraud, Bypass fraud, SIM cloning and Internal fraud are the major fraud causes and the most concern to ethio telecom. Hence, the implementation of a package of solutions or fraud management system, new methodologies and technical means is a must for ethio telecom to deal with varying telecom frauds beforehand and afterward. That is, it should properly identify the causes of telecom fraud and the methods of detection in order to solve the problems of fraud using different methods, skills and knowledge in order to mitigate the impacts of it.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The Telecommunication Industry began with the use of smoke signals and invention of telegraph in 1844 made possible wired communication, telephone enabled voice transmission. It continues to grow steadily on a global scale. Nowadays telecommunication companies witness dramatic changes at all levels. There are many drivers for change in the telecommunication sector; caused by globalization, technological advancement, telecom fraud, fierce competition that has risen drastically in the last years, and the need to develop new services in the telecommunication sector. Telecommunication organizations need razor-sharp reflexes to cope with the fast changing technologies.

The telecommunications sectorhas been among the best performing industries in the world in recent years. However, telecom companies face different challenges that stem from technology trends and customer demands. The convergence of applications, networks or content in this new-age information super highway has become the next path-breaking move in core mass-market technology providing single connectivity and integrated user experience.

The development of the telecom is very dynamic in its nature of innovation and dissemination and plays a great role in social and economic development of any given country. In addition to this, the development of communication sector plays a vital role in overall development of all sectors related to social, political and economic affairs.

In the modern world, the Telecommunications sectorto be of same significance as the central nervous system has with respect to human body. Telecom industry builds, maintains, and operates telecommunication networks which enable one of the most essential services to humans and organizations globally, ability to communicate intra and cross borders.

The paper presented key concepts, issues, challenges and opportunities associated with telecom sector management, and what strategies gets employed to meet some of those challenges and opportunities. It also tries to present the trends and business models of the industry.

In Ethiopian, the telecommunication services expansion program, especially to the rural areas of Ethiopia has shown remarkable progress in the development of telecom service as the goals set by the Government. The expansion activity will continue aiming at covering more places to enhance social and economic development for the benefits of people living in the rest of underserved and un-served areas of the country. This will increase the number of telecom service subscribers and level of penetration, which is an opportunity for ethio telecom.

In general, it is found out that the major challenge and opportunities of managing the telecom sector of Ethiopia are:

- **Technological advancement is impacting the telecom industry:** Telecom industry is investing heavily in technological innovation, and hence Technological advancement in the recent times have dramatically changed the dynamics of players involved in the telecommunications infrastructure, equipment and services sectors as advancements and innovations are being made in all sectors of telecommunications industry. This changes the needs, demands and expectations of ethio telecom customers, and hence ethio telecom needs to keep pace by creating products and services meeting these demands.
- **WTO accession will create new opportunities and as well impose new challenges to the Telecommunication Sector of Ethiopia:** Competition will accelerate the development of telecommunication industry which will in turn positively influence on other aspects of both society and economy. Foreign participation in the telecommunications sector can help to attract foreign investment and get international experience, however, it also give risks to Ethiopians economy and political regime.

- Telecom Fraud is one of the serious challenge of etho telecom: currently telecom fraud is a serious challenge for ethio telecom as it is not possible to enumerate completely and exhaustively all the existing fraud types, due to the fact that fraud types are adapted and new fraud types are developed all the time. However, subscription fraud, bypass, SIM cloning and Internal Fraud are the major frauds in ethio telecom. Even if there is Fraud Management system in the company, the fraud is detected after all the damages happened. That is, the methods to detect fraud is reaction-based and hence it detect a fraud after it has happened. Moreover, it is found out that there is lack of proper knowledge and skill to handle the Fraud Management System.

5.2 Recommendation

Telecommunications sectorbecomes more and more important for the development of any country as it plays an important role to improve efficiency of the economy and the country's competitiveness, which intern promote economic and social development of that country. However, this needs to manage the challenges that the industry facing nowadays and grasp the opportunities. Accordingly, based on the findings of the research, the following measures are recommended to utilize the opportunities and mitigate the impact of the challenges.

- **Create Strategic Alliance and Partnership with High Technology Companies around the World:** Ethio telecom shall create strategic relationship and partnership with high technology companies of the world, like ZTE, Huawei, Ericsson, Nokia and so on in order to benefit from the technological advancement of the industry and to generate greater value for its customers.

- Ethio telecom should properly identify the causes of telecom fraud that it faces and the methods of detection in order to solve the problems of fraud using different methods, skills and knowledge in order to mitigate the impacts of it. For this it should implement

a fraud management system that detect frauds before it happen and damages occurs. Moreover, it should develop the fraud management skills and capacity of its staffs through proper training and knowledge transfer.

- **Ethio telecom and the Government shall implement appropriate policies and strategies to avoid the risks and grasp the opportunities of joining WTO. For this:**
  - ***Government shall main control over the backbone of the telecom network:*** telecommunications is a very sensitive sectors which affects all economy, political regime and social life, Ethiopian government should still remain its management over the telecom backbone of the telecommunications network in the near future to ensure security.
  - ***Improve domestic competitiveness:*** toward joining the WTO, improving domestic competitiveness is crucial for Ethiopian telecommunications sectoras it will enable the domestic enterprises to compete with foreign investors in the future. For this, firstly, the government should encourage local companies to participate in telecommunications market. The participation of new companies will promote competition in the industry. New companies will bring more financial sources into the industry and they can use it for infrastructure construction. Secondly, during the time to adjust telecommunications industry, the Government should provide all the companies more favorable conditions to develop. This will help them to improve their competitiveness to cope with foreign enterprises in the future, at time of WTO accession.
  - ***Invest on constructing telecommunications infrastructure:*** The Government and thio telecom should invest more on telecommunications to construct and modernize telecommunications infrastructure. Infrastructure construction by the Government will help to maintain the state control over the backbone of telecommunications network later, even when the foreign investors penetrate the market.

- ***Strengthen human resource:*** Human resource is very important in knowledge-based economy and an industry cannot develop without strong human resource. Therefore, ethio telecom should work more on developing local capacities of potential mployees. Moreover, it should organize and facilitate more workshops, training programs and experience sharing with other foreign international telecommunication companies.

- **Establish Research and Development Center of Telecom:** The respondents stated that there is no or very low research and technology transfer activities in ethio telecom. Hence, ethio telecom and the Government considers investment on Research and Development (R&D) Centers for sustained development of Telecom Industry of Ethiopia, and as well for scientific progress.

In recognition of the important role that research and development transfer plays in facilitating the country's socio-economic development process in general and Telecom in particular, the Government and ethio telecom shall commit to develop Research and Development (R & D) center of Telecommunication. To realize this it is necessary to:

- develop Telecom Research and Development Policy and Strategy,
- allocate adequate resources /budget to research and development transfer for hardware and software development, communications, information networks, technology etc, and
- provide different incentives for the private sector in order to encourage it to invest in research and development areas.