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CONTRIBUTIONS OF INFORMATION AND COMMUNICATION TECHNOLOGY IN THE PUBLIC SECTOR:
THE CASE OF THE ETHIOPIA COMMODITY EXCHANGE

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Abbreviations and Acronyms

AMC	Agricultural Marketing Corporation
BC	Before Christ
BBC	British Broadcasting Corporation
CERN	European Organization for Nuclear Research
ECX	Ethiopia Commodity Exchange
ETV	Ethiopian Television
FAO	Food and Agriculture Organization
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
GoE	Government of Ethiopia
ICT	Information and Communication Technology
ICTDA	Communication Technology Development Agency
ICT4D	ICT for Development
IDI	Information Development Index
ISO	Chief Information Officer
IT	Information Technology
LAN	Local Area Network
MCIT	Ministry of Communication and Information Technology

MoT	Ministry of Trade
NRI	Network readiness Index
OAU	Organization of African Unity
OCFCU	Oromia Coffee Farmers‟ Cooperatives Union
SCFCU	Sidama Coffee Farmers‟ Cooperatives Union
SMS	Short Messaging Service
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
VIR	Interactive Voice Recognition
VTF	Virtual Trading Floors
WPE	Workers‟ Party of Ethiopia
WWW	World-Wide Web

Abstract

The main objective of this case study is to investigate the contribution of Information and Communication Technology (ICT) to the public sector, with a particular emphasis on the Ethiopian Commodity Exchange. The study evaluated the how ICT application of the Exchange support its various operations and its clients. Descriptive case study research method is used, and it applied questionnaires and interviews as a data gathering instruments. Data were acquired through questionnaires to evaluate the contributions of the application of ICT in the ECX since its formation in 2008, and opportunities and challenges it created to commodities exporters. In addition to this, interview guides were prepared and interviews were conducted with ICT/IT department of the exchange and the Ministry of Communications and Information Technology senior ICT officer. In the meantime secondary data analysis conducted to investigate the contributions of ICT to the exchange"s operations since its formation in 2008. The research adopted mainly qualitative data analysis. The application or introduction of intensive ICT technologies in the Ethiopian commodities market is a new and recent experience. It has not been explored academically and the researcher considered this as a major research gap. Hence, in this research I explored what contributions and changes the ECX brought to the county"s commodities sectors. The Government of Ethiopia is the owner of the ECX, and it is established as public enterprise in 2007 under the proclamation No. 550/07. In this research paper the theory of E-Government and E-Governance along with economic theories that justifies the need for institutionalized exchange formation were also assessed. In the context of this study ICTs was found to be contributing significantly to the Ethiopian commodities market in its application of various technological ICT support systems that facilitates the daily transaction activities of its own and exporters various operations, ICT also enhanced decision-making capacity, and create an opportunity for a smooth and faster clearing and settlement of transactions. The most common perceived barriers felt by exporters are the exchange"s website was not user-friendly, unable to know the stock positions at the exchanges" hand, frequent communication breakdown and interruptions, and increased operational costs are among the few to mention.

Chapter One

1. Introduction

1.1 Background

The emergence of information communication technologies has brought a lot of changes to the way things are done in the world. These changes are across the spectrum; the way private companies do business, the way universities do things, the way governments provide services to their citizens and the way they interact with stakeholders at large.

Public sector is increasingly seen as the main engine to bridge the digital divide at country level. Public agencies can start acting as model users of ICT and be catalysts for others to follow. The public sector tends to be the biggest provider of local content and it can nurture and foster the further development of the local ICT industry.

ICT emanates from the combination of three interrelated words: Information, Communication, and Technology. Information refers to the summarization of data. As data are raw facts and figures it needs to be summarized, processed and presented in different formats like lists, spreadsheets, images or audio and video (Longman, 2011).

While Communication – represented the two way process of reaching mutual understanding, in which participants not only exchange (encode-decode) information, news, ideas, and feelings but also create and share meaning. In general, communication is a means of connecting people or places. In business, it is a key function of management, otherwise and organization cannot operate without communication between levels, departments and employees.

Technology on the other hand is the science or knowledge put into practical use to solve problems or invent useful tools.

In this regard, ICT is viewed as a complex process, articulated over time, embracing the overall systems in which information; communication and technology operate and interact with individuals, organizations and communities to perform their functions, achieving public ends by digital means.

ICTs have proven to be indispensable tools in the sharing and dissemination of knowledge. The degree to which ICTs have aided information access is simply extraordinary. A fair, proper and equitable use of ICTs certainly will enable the widest distribution of information and knowledge across the board to as many people as possible (Aman, accessed 2/17/2014).

The term „information and communication technologies" (ICT) can be used to embrace a multitude of stand-alone media, including telephone, television, video, tele-text, voice information systems and fax, as well as those requiring the use of a personal computer fitted with a modem. The latter can include direct dial-up services such as electronic banking, file exchange and closed information services. [ICT]… tends to concentrate on the ubiquitous internet and its associated services, including electronic mail (email), electronic bulletin boards and the World-Wide Web (WWW) (Warren, 2002).

For over a decade ICT has come to dominate daily life around the globe. Whether it is for financial information, markets, news, general knowledge or simply entertainment, the ease and speed of communication has grown phenomenally (McBriarty, 2011).

In an attempt to solve different problems of traditional commodity market operation and its subsequent drawbacks, the government of Ethiopia allowed the launching of Ethiopia Commodities Exchange in January 2008. Initially the Ethiopia Commodity Exchange launched trading operations with contracts for white and mixed maize, hard and soft wheat, processed - unprocessed haricot beans and began trading coffee in December 2008 (ECX, brochure). The exchange uses different ICT infrastructure to achieve its objectives. The infrastructure would enable it to provide market information, to facilitate various operations, and to meet its duties using different technologies and to meet the expectations of its clients.

As mentioned by McBriarty (2011) ICT can bring unprecedented potential to deliver information, provide links to markets and much more (Mukhebi, 2007).

The purpose of this study is to assess the contributions of ICT to the operations of the ECX, and how the application of ICT by the exchange is perceived by exporters.

1.2 Statement of the Problem

Some 75% of developing countries‟ population lives in rural areas, and of these the vast majorities are small-scale farmers, who contribute significantly to the economy yet remain as the poorest (Melchioly & Sæbo, 2010). If this is to improve then knowledge and information are critical, according to Muriithi et al. (2009), and application of ICT in the public sector should be included in any poverty alleviation programme.

As per study of Gakuru & Stepman, (2009) ICT can provide two basic services in the commodities trading sector: market information and agricultural information. ECX introduce ICT in the trading system and its different

operations since its formation. The ICT technologies include market information tickers, mobile phone Short Messaging Service (SMS), Interactive Voice Response (IVR) service, and Website (www.ecx.com.et) (http://www.ecx.com.et/Operations.aspx#RM). Moreover, the exchange applies ICT in its various operations at different degrees and magnitudes to facilitate its activities and communicate with different stakeholders.

However, regardless of ICT‟s basic benefits, Ethiopian agricultural sector suffers from low level of productivity and absence of sound ICT system. ICT‟s application is at its minimal state, it is characterized by insufficient market information provision, poor quality of service and accessibility, unstable price, lack of trust among trading partners, and uncoordinated markets. The lack of market information is characterized by highly fluctuating prices and huge price overhead on the consumers. Farmers are getting only a small portion of the profit margin due to the existence of multiple brokers at every stage of the market chain (Assegid, 2010).

The Government of Ethiopia is the owner of the ECX, and it is established as public enterprise in 2007 under the proclamation No. 550/07. After its formation, the ECX is expected to provide solutions for the problems mentioned earlier. So, to bridge the gap between the need for comprehensive ICT application and the actual problems on the ground the exchange applied different types of ICT tools in its various operations to communicate with its partners. The application or introduction of intensive ICT technologies in the Ethiopian commodities market is a new and recent experience. It has not been explored academically and the researcher considered this as a major research gap. Hence, in this research I explored what contributions and changes the ECX brought to the county‟s commodities sectors. Due to these factors, the research

evaluate the contributions of ICT in the ECX‟s activities after the formation of the exchange in 2008 in regard to the application of ICT in commodities market information delivery, which have been in low level of technological application for long period of time, and to investigate what benefits and challenges the ICT application created need to be addressed. In addition, the research needs to assess the effectiveness of the system in addressing communication related challenges.

1.3 Research Questions

In this study attempts will be made to answer following questions:

1. What is the role of ICT to the commodities sector, especially to the ECX?
2. What are the contributions of the application of ICT to the operations of the ECX?
3. What are the opportunities and challenges that exporters face as a result of the exchange‟s use of ICT applications?

1.4 Objectives of the Study

General Objectives

The general objective of this study is to investigate the contribution of ICT to the ECX‟s complex operations, and what opportunities and challenges its members, particularly exporters, face due to the application of ICT by the ECX.

Specific Objectives

- To investigate the role of ICT to the commodities sector

- To investigate the operations applying ICT at the exchange,
- To investigate the pre and post commodity market information dissemination processes - from the ICT perspective

1.5 Scope and Delimitation of the Research

The scope of the research is delimited to the analysis of the contributions of ICT to the public sector in a case of the ECX. In addition to that the research investigates the opportunities and challenges the ICT application created to its exporters members. The study is covers periods from the 2008 to 2012/13 fiscal year, since the formation of the ECX as a public institute under the supervision of the Ethiopian Commodity Authority which was formed by the official decree of proclamation No. 550/07. It will exclude farmers and other stakeholders and only limited to exporters of commodities traded at the exchange.

1.6 Significance of the Study

The research gave detail information on how ICT is contributing in the ECX‟s various operations. It also shows how ICT is important to tackle the long standing commodities markets challenges and problems like lack of sufficient market information, lack of trust among trading partners, delayed delivery of purchased commodities from regional warehouses due to infrastructural issues, increased transaction costs etc. It point out factors that affect exporters due to low level of ICT application challenges in infrastructure problems of the country. It also looks at how e-governance could support the public sector in enhancing services and products it offers to the public. The findings of the study will benefit the exchange, exporters, and different organizations that have a stake in the developing effective ICT system and for those who want to involve in the sector in the future. The research can also contribute for similar

areas of study. Furthermore, it can also serve as addition to existing literature of application of ICT in the public sector.

1.7 Organization of the Paper

This research paper consists of five chapters. Chapter one deals with the introduction, statement of the problem, research questions, objectives, delimitation, and significance of the study. The second chapter presents the review of related literature and key words, which are relevant for the research. The third chapter presents the methodology and research design for data collection purpose. The fourth chapter presents and discusses the research findings. The last chapter comprises of conclusions.

Chapter Two

2. Review of Related Literature

2.1 Definitions of Key Words

Commodity Exchange: "is simply a central place where sellers and buyers meet to transact in an organized fashion, with certain clearly specified and transparent „rules of the game"" (Gabre-Madhin and Goggin, 2005).

ICT: refers to "forms of technology that are used to transmit, process, store, create, display, share or exchange information by electronic means and includes such technologies as radio, television, video, DVD, telephone (both fixed line and mobile phones), satellite systems, and computer and network hardware and software, as well as the equipment and services associated with these technologies, such as videoconferencing, email and blogs" (UNESCO, 2007).

2.2 Definitions and Concepts of the Theory of E-Government and E-Governance

Information and Communication Technologies (ICTs) play a key role in development & economic growth of the developed and developing countries of the World. Political, cultural, socio-economic developmental & behavioral decisions today rests on the ability to access, gather, analyze and utilize Information and Knowledge. Definitions and concepts of the theory of e-government and e-governance are vital whenever discussions on public sector"s ICT participation rose, and their definitions from the perspectives of different authors and institutions presented as follows.

E-government is a generic term for web-based services from agencies of local, state and federal governments. In e-government, the government uses information technology and particularly the Internet to support government operations, engage citizens, and provide government services. The interaction may be in the form of obtaining information, filings, or making payments and a host of other activities via the World Wide Web (Sharma & Gupta, 2003).

The World Bank defined e-government as "the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government. These technologies can serve a variety of different ends: better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, or more efficient government management. The resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth, and/or cost reductions." (www.worldbank.org).

Another Definition from Palvia and Sharma (n.d) on e-government in the Developing World considered to be "the use of information and communication technologies (ICTs) to promote more efficient and effective government, facilitate more accessible government services, allow greater public access to information, and make government more accountable to citizens. E-government might involve delivering services via the Internet, telephone, community centers (self-service or facilitated by others), wireless devices or other communications systems."

While definitions of e-government by various sources may vary widely, there is a common theme. E-government involves using information technology, and especially the Internet, to improve the delivery of government services to citizens, businesses, and other government agencies. E-government enables citizens to interact and receive services from the federal, state or local governments twenty four hours a day, seven days a week.

On the other hand, e-governance, meaning „electronic governance" is using ICTs at various levels of the government and the public sector and beyond, for the purpose of enhancing governance (Bedi, Singh and Srivastava, 2001). According to Keohane and Nye (2000), "Governance implies the processes and institutions, both formal and informal, that guide and restrain the collective activities of a group. Government is the subset that acts with authority and creates formal obligations. Governance need not necessarily be conducted exclusively by governments. Private firms, associations of firms, nongovernmental organizations (NGOs), and associations of NGOs all engage in it, often in association with governmental bodies, to create governance; sometimes without governmental authority." Clearly, this definition suggests that e-governance need not be limited to the public sector. It implies managing and administering policies and procedures in the private sector as well.

In the meantime the UNESCO working definition of the e-governance refers to it as "it is the public sector"s use of ICTs with the aim of improving information and service delivery, encouraging citizen participation in the decision-making process and making government more accountable, transparent and effective. E-governance involves new styles of leadership, new ways of debating and deciding policy and investment, new ways of accessing

education, new ways of listening to citizens and new ways of organizing and delivering information and services. E-governance is generally considered as a wider concept than e-government, since it can bring about a change in the way citizens relate to governments and to each other. E-governance can bring forth new concepts of citizenship, both in terms of citizen needs and responsibilities. Its objective is to engage, enable and empower the citizen, (www.unesco.org)."

2.3. Economic Theories for Commodity Markets

Different economic theories provide several explanations for the existence of commodity exchange markets. For the purpose of this research following three theories selected: the neoclassical theories, institutional theories, and organization theory. The economic reasoning on the role of ICT in the development process is that the technology enhances the functioning of the markets because it provides information to producers and consumers in order to help them make efficient choices (Eggleston et al. 2002).

2.3.1. The Neo-Classical Theories

The theory of neoclassical economics is basically used for approaches to economics focusing on the determination of prices, outputs and income distribution in markets through supply and demand. In the neoclassical approach, changes in the society are studied through the relation between supply and demand for the factors of production (mainly land, capital and labor) (Linden, 2011).

The theory states the market refers to any domain of economic interaction, where prices are responsive to supply and demand. Unless hindered by nonmarket forces, all markets have a natural and spontaneous inclination to

evolve into a perfectly self-regulating one, where resources are distributed efficiently, if not justly (Smith, 1776). To ensure both the evolution of markets toward a perfect version and the market setting its prices freely, neo-classical researchers argue that nonmarket forces should not intervene in the delicate balance of supply and demand.

Neoclassical economics analyses the situation of the market from the point of view of an agent. In this school of thought, a firm is assumed to act rationally, thus it chooses the best option to trade. The perception of the market as a natural balance of the forces of supply and demand has contributed to the making of markets by informing the construction of various options markets, ranging from agricultural commodities exchange markets to securities (Gemoraw, 2011).

2.3.2. The Institutional Theories

Institutionalism theory has departed from neo-classical theory by arguing that all free markets require an institutional structure to mediate the convergence of market forces. Moreover, spontaneous development of markets could be stalled by nonmarket factors such as the state. According to this theory, institutions directly affect economic outcomes, and the agents of markets use them to reach their individual ends (Williamson, 1985; North, 1990).

In this school of thought, market is perceived as the set of institutions which mainly includes the following: formal and informal contracts between individuals or groups; trading practices, codes of conduct, and social norms, such as repeated interaction, trust, and reciprocity; formal commercial laws and regulations that govern market relations; and institutional arrangements between actors such as vertically or horizontally integrated supply chains.

The 2002 World Development Report of the World Bank explains to the extent that social change is understood to be implicated in the dynamic intertwining of technology innovation and an effective market economy, the current discourse on development seeks to emulate the institutions of the few societies that have achieved the mobilization of ICT innovation to sustain economic growth through competitiveness in global markets (World Bank 2002).

2.3.3. Organizational Theory

This theory is the network of economic links which integrate transnational labor processes and corporations involved in global sourcing and global marketing of products. The recent approach advocated under this school of thought and related with the issue of commodity exchange is the global commodity chain analysis approach. This approach, like institutional theory, explicitly acknowledges the importance of human relations within marketing chains. This approach emphasizes the shifting bases of power exercised by leading firms in globalized chains linking producers, processors, distributors, and consumers and the impact of the governance structure on shaping outcomes for the market. Its main focus is on the linkages and coordination between economic agents and the outcome for the whole chain (Gemoraw, 2011).

According to the study of Avgerou (2003), the existing capacity of ICT in the socio-economic fabric is considered a condition of „readiness" for further ICT development through network-based activities. The diffusion of ICT in all sectors of the economy and society, together with the liberalization of the telecommunications sector, are set up as desirable policy targets in their own right.

2.4. Theoretical Benefits Expected from Commodity Exchange

According to the study of UNCTAD (2009) there are theoretical benefits expected as the result of formation of commodities exchanges, as the study mentioned in the work of Gemoraw (2011), the theoretical benefits that commodity exchanges are intended to offer can be classified into three major categories: price discovery, risk management and facilitation of commodity trade. There are also a further set of specific benefits under each category.

Price discovery

Price discovery refers to the mechanism through which prices come to reflect known information about the market. Commodity exchange provides a mechanism for price discovery which simplifies transactions with standard contracts, and transmits information about prices and volumes. In other words, the price level established on the open market can therefore represent an accurate depiction of the prevailing supply/demand situation in the underlying commodity markets.

The benefits of price discovery can be categorized as those arising from a more efficient price formation process, and those arising from the wider supply of more – and more accurate – market information. The former refers to those benefits arising from the proper alignment of supply and demand, ensuring that the market pricing signal triggers efficient production, purchasing and investment decisions by participants in the sector. The latter refers to those benefits arising from the publication and dissemination of market information, with the resulting price transparency providing a readily available, authoritative and neutral price reference to sector participants (ibid).

The major specific benefits expected under this category are that:

- All marketing actors, farmers and others involved in a commodity market, will become more informed about market and pricing information
- All marketing actors, farmers and others involved in a commodity market, will get improved prices because of an authoritative reference price
- The marketing chains will be reduced due to squeezing out rent-seeking intermediaries from the chain
- Increased returns to farmers as it enables them to hold back on selling until the price level is good
- Farmers are empowered as they can take more marketing decisions into their own hands
- Both intra - seasonal and inter- seasonal spot price volatility will be reduced

Risk management

A commodity exchange can provide risk management solutions by offering trade in commodity futures and spot contracts. A commodity exchange adds value to the market by addressing two types of risk namely contract performance risk and market risk. Market risk is the risk of adverse unforeseen price movements or changes in supply and demand in the future. The way that a commodity exchange addresses the problem of contract performance risk is by ensuring that products that are traded are as standardized as possible, the products are receipted and certified, that market information is disseminated to all, and payment and delivery are guaranteed to both parties of the transaction (buyer and seller) through a clearing and settlement system (Gabre-Madhin and Goggin, 2005). With regard to market risk, the way that a Commodity

Exchange addresses the problem of the uncertainty brought about by time is by enabling market actors to lock in or hedge the value of their trading positions. Hedging is a way to eliminate the market risk and involves the notion of offsetting which actually involves two transactions. Offsetting means that in order to hedge the market risk, a market actor will balance one transaction (purchase or a sale) in the spot market followed by another transaction in the opposite direction in the futures market.

The specific benefits expected due to the risk-management function of a commodity exchange are to:

- Avoid serious losses that farmers face when prices fall
- Enable farmers to receive a guaranteed price from a purchaser or intermediary
- Reduce transaction costs for managing risk compared with other methods.

Facilitation of Commodity Trade

The usefulness of a commodity exchange lies in its institutional capacity to remove or reduce the high transaction costs often faced by entities along commodity supply chains in developing countries. A commodity exchange reduces transaction costs by offering services at a lower cost than that which participants in the commodity sectors would incur if they were acting outside an institutional framework. These can include but are not limited to the costs associated with finding a suitable buyer or seller, negotiating the terms and conditions of a contract, securing finance to fund the transaction, managing credit, cash and product transfers, as well as arbitrating disputes between contractual counterparties. Therefore, by reducing the costs incurred by the parties to a potential transaction, a commodity exchange can stimulate trade.

In addition to reducing transaction costs, the other specific benefits that would be expected under this category are that:

- Through enhancing storage and logistic infrastructures, farmers‟ need for distress sales will be reduced and they can access more distant markets
- Quality standards will be upgraded through enhancing scientific storage and reducing the diversity of quality standards in the market
- Expands export opportunities

A commodity exchange, through the above major benefits of price discovery, risk management, facilitation of commodity trade can therefore help in the establishment of efficient agricultural markets. It also expected to offer the following other major specific benefits:

- Due to the assurance of a stable supply of quality produce at predictable prices, it will encourage investment in agro-processing as well as in agricultural marketing.
- The exchange represents a transparent and often reliable means by which lenders can liquidate collateralized commodities in the event of default by the borrower. Therefore, it facilitates access to commodity finance.

Properly functioning commodity exchanges can promote more efficient production, storage, marketing and agro-processing operations, and improved overall agriculture sector performance.

2.5 ICT Infrastructures Components in the Commodities Markets

ICT infrastructure refers to the set of hardware, software, and networking components which help in facilitating the services and goods any organization produce. These ICT infrastructures enable an organization to ensure that

introducing changes into operations has the least impact possible to the business and its customers.

Following are listing of some of the basic ICT infrastructures used in commodities markets to sustain smooth working environment (TTS, n.d):

Network Infrastructure:

- Routers and firewalls
- Cabling backbone
- Network coverage
- Switches/LAN Topology
- Wireless networking
- Power management/UPS protection
- CCTV

Servers and storage:

- Directory system and structure
- Physical server makes, models, ages, OSs, services
- Backup, Archiving & Disaster Recovery
- Server types (physical, virtual or hosted), roles and services:
- File and print, Email, Proxy, Application, Storage, Management, Deployment, Remote access, Web, Antivirus

Key Software Systems:

- Accounting System
- Student Management System
- Learning Management System
- Library Management System
- Public Cloud Services e.g. (Google Apps, Office365)
- Key client applications in use

Security:

- User authentication and password policies
- Internet filtering, monitoring, reporting
- File/folder/database permissions
- Security logging/monitoring/procedures for incident management
- Patch management
- Wireless authentication

- Security breaches
- Physical theft prevention

Access devices (Estimate of quantities, makes, models, ages, OSs):

- Desktops
- Laptops/Netbooks
- Thin clients
- Tablets

Printers (Estimate of quantities, types, locations):

- Printing/Copying devises
- Print charging software

Other Technologies:

- AV (projectors, TV"s)
- IWBs/Clickers
- Video Conferencing
- Significant peripherals (robotics, cameras etc)

Communications:

- Telephony system (type, number of handsets/extensions, age, connectivity (SIP trunks, ISDN, Analogue lines etc)
- Internet (ISP, plan, measured speeds)

Technical support:

- Technical support contract info (level of personnel, hours, costs, service levels)
- Technical support request procedures – in-house and out-sourced
- Technical maintenance practices
- Technical asset planning/ lifecycle replacement strategy
- Technical documentation/inventories
- Telephony supplier

2.6 Historical Background of ICT in Relation to Commodity Markets

The history of ICT starts from modest beginnings, which include the abacus. The abacus is believed to have been initially invented about 3000 BC. Intel Corporation released the first microprocessor in 1971. Tim Lee developed the

World Wide Web in 1991, and CERN – the European Organization for Nuclear Research also created the first Web Server (Perry Barnes, n.d).

As indicated by various authors, the ICT experienced four revolutions in its history. "The first revolution comprised films, radio, television and satellite broadcasting, which is termed by many as „paper and pencil" way of knowledge delivery. The second revolution included telecommunications and microcomputers" (Kaino, n.d). The third revolution was the integration of telecommunications and microelectronic technology in computing, which came to be known as Information Technology (IT). The third revolution was said to "promise not only a more productive person, a problem-solver and a life-long learner, but also a better informed, rational and participative citizen, a modern person, living in the web and network of a worldwide electronic community" (Papagiannisetal, 1987). Lastly, the current trend in ICT has brought a phenomenon, which can be termed a fourth revolution in IT. In the fourth revolution, as McGrew (1992) pointed out "…ICT has a globalization component force that has replaced other revolutions and accelerated its influence worldwide. Globalization has been described in many forms such as the intensification of interconnectedness."

The information and communication technologies (ICT) sector has seen a rapid development since the last ICT sector strategy of the World Bank Group (WBG) was prepared in 2000. The total number of mobile phone subscriptions in developing countries jumped from 200 million in 2000 to 3.7 billion in 2010, and the number of Internet users grew more than ten times. As reveled by the group"s study in 2010, the proportion of population in the less developed countries with access to fixed or mobile telephone has reached 70 percent; and more than 20 percent of the population of developing countries use internet.

ICT is therefore, no longer a luxury good but a necessary utility for the poor including those developing countries. As a result, its vital role in advancing socio-economic developments and alleviating poverty has been significantly increased (World Bank Group, 2011).

Technological developments have elevated more than 10 percent of the world‟s population out of poverty since 1990, making it the biggest driving force behind economic growth. In recent years, the information technology (IT) service industry has become another main force of job creation in less developed countries, especially for youth and women, and it has favored trade and competitiveness through exports (Ibid).

ICT played a vital role in the commodities trading activities for centuries. Communications have been the core element of markets in many countries. In the manuscripts found in Venetian merchants in the twelfth century, traders uses different accounting tools to know the assets they have, the receivables that would be collected and taxes due to provincial tax offices. Modern day commodities exchanges applied various ICTs technologies to be more competitive and enhance their marketing shares and profitability. Starting from the old days of pens and pencils, now day commodities markets are applying modern supper mainframe computers and sophisticated servers and software to improve their performances and be more reliable and accurate services.

2.6.1 ECX Formation and Governance

The ECX was established as a public enterprise in which buyers and sellers come together to trade and to be assured of quantity, quality, delivery and payment. As quoted in the case study of Gemoraw (2011), the exchange is “uniquely structured as a private-public partnership commercial enterprise. The

Government of Ethiopia is the owner of the ECX, while the ECX offers the sale of Membership seats, which are privately owned, permanently and freely transferable rights to the stream of earnings from trading on the Exchange. ECX is established as a demutualized corporate entity with clear separation of ownership, membership, and management. Thus, owners cannot have trading stake. The management can be neither drawn from the owners nor from the members" (Gabre-Madhin and Goggin, 2005).

The ECX is established as public enterprise on proclamation No. 550/07, and it is governed by the following three bodies:

1. The Ethiopian Commodity Exchange Authority (ECEA) as a state regulatory body. This is a public institution, which approves and regulates contracts, membership, trading, clearing, and other ECX rules.

2. A joint Board of Directors drawn from relevant public institutions (state) and ECX members (private), and

3. The National Exchange Actors Association (NEAA), an institution established by ECX members and their Authorized Representatives and Associates.

2.6.2 Operations of the ECX

Many exchanges around the world have focused on providing a single service; a well-functioning trading platform through which sellers and buyers can meet, discover prices and trade. The ECX also operates in an environment where there are important related services, such as trading, warehousing, clearing and settlement, market data dissemination, and market surveillance etc. (see below Figure 1). In the following sub-section presented a short overview of the major

services currently offered by ECX. The exchange utilized various ICT tools like the internet, email, telephones, etc to comnicate internally within its different operations and with its external clients to facilitate its services.

Figure 1 ECX Operations. Source: www.ecx.com.et/operations

2.6.2.1. Trading Operations and Contracts

One of the major services offered by the ECX are trading operations and trading contracts. The ECX trading system initially started as a physical trading floor located in Addis Ababa and transitioned to an electronic trading platform over time. The trading floor uses “open outcry” price bidding where all interested sellers and buyers verbally negotiate simultaneously during trading hours. Trading is conducted for each commodity class based on the grade given for the specific class of commodity by the ECX warehouses. The transaction orders for sales and purchases are transmitted to ECX members using telephones and are recorded on order tickets. Once an order is executed, meaning a deal is made; the order ticket is electronically entered and reconciled in the ECX automated back office system to ensure the existence and validity of the warehouse receipt backing the sale, the availability of buyer funds in a

deposit account, and the validity of the member-client agreement. This automated reconciliation takes just minutes and is key to giving all market players confidence in the market.

To date ECX undertakes contracts for spot contract trading. Each contract specifies the grade, lot size, payment terms, price quotation (currency and unit), tolerance, dispute settlement, and other parameters for any commodity. Thus buyers and sellers only have to agree on the price and quantity. The standard lot size of an ECX contract is 50 quintals or 5 tons for all commodities, tailored to the current conditions of small truck transport in rural Ethiopia. ECX contracts are designed to create a national marketplace where all buyers and sellers meet to determine the national reference price. Thus, all ECX contracts are quoted as "arrived Addis Ababa" and a location differential is applied (based on the transport tariff from Addis Ababa to the delivery location) at the settlement of the transaction depending on the actual location of the physical commodity at delivery. ECX regularly updates the transport differential and makes this information known in advance.

2.6.2.2. Warehousing and Grading

ECX offers an integrated Physical Delivery Management System from the receipt of commodities on the basis of industry accepted grades and standards for each traded commodity by type to the ultimate deliver. To sell agricultural products through ECX, sellers are required to deposit their goods in the ECX warehouses. Currently, ECX has seventeen warehouses in different parts of the country; to mention some: Addis Ababa, Awassa, Dila, Jimma, Bonga, Dire Dawa, Adama, Shashemene, Nekempte, Bure, and Humera. At the ECX warehouses, commodities are sampled, weighed, and graded. The goods are labelled by type and origin and are given a quality grade according to a

standardized set of measurements. For example in coffee, grade 1 is highest and best grade and grade 10 is the lowest. These combinations of labels (called a symbol) together identify the type of product that is being sold.

Once the grading process is completed, the sellers who deposited the commodities are issued an electronic goods received note, which is electronically transmitted to the ECX central depository, where the electronic warehouse receipt is created and securely kept. The central depository possess a central automated registry of warehouse receipts of all depositors, similar to any asset-holding account, which can be debited in decrements when sales are made on the ECX trading floor. This system avoids the risk of fraud or loss of paper receipts, provides flexibility in selling partial amounts of the deposited commodity, and increases the efficiency of physical delivery. At sale, the ECX central depository debits the seller‟s account and automatically transfers title of the commodity to the buyer and issues a delivery notice, on the basis of which the commodity can be released to the buyer.

2.6.2.3. Clearing and settlement

To eliminate risks of contract defaults, all payments have been cleared and settled through the ECX internal clearing house in collaboration with the major banks in Ethiopia to be able to issue transfers between the accounts of traders. In other words, the ECX takes the role of receiving payments for all transactions from buyers and transferring these funds to all sellers of commodities, and receiving all Warehouse Receipts from all sellers of commodities and transferring them to all buyers.

The ECX Clearing House works closely with the central depository and with ECX approved settlement banks. The ECX requires that all members maintain

both a pay-in and a pay-out account in these banks where ECX also maintains a settlement account. At the end of every trading day, the ECX Clearing House calculates the net obligations of all its active members to determine whether funds need to be transferred from the members‟ pay-in account to the ECX settlement account or vice-versa to the members‟ pay-out account. All pay-in transfers to ECX are made on the same day as the transaction and all payout transfers are made on the following morning. Similarly, all transfers of warehouse receipts to the buyer are made by the central depository the following day after pay-in has been made to the seller.

2.6.2.4. Market data dissemination

The major benefits of the ECX in transforming an age-old traditional agricultural marketing system is through providing accurate, reliable, and timely data on a continuous basis to all market players using different ICT technologies. The ECX market data department handles the tasks of interpreting current market trends and disseminating market information to the different groups. Data on opening price, highest price, lowest price, last traded or current price, and volume of trade are transmitted continuously using electronic networking to electronic price display boards located in public sites in Addis Ababa and other major market centers around the country for every commodity grade traded on the Trading Floor.

2.6.2.5. Market surveillance

Market surveillance is also one of the major services offered by ECX to keep track of market actors to discover different types of extraordinary behavior, which may initiate further investigation and possibly lead to expelling the trader from further access to the market. In this regard, ECX experts regularly conduct surveillance on market trends as well as conduct audit and

investigations on market operations to protect the market from manipulation, excessive speculation, fraud, or other malpractice.

2.7 Background of the Ethiopian ICT Sector

Ethiopia‟s economy is primarily agrarian and subsistence. According to Alemayehu (2014), “agriculture accounts for nearly 71% of the country's total exports and manufacturing accounts only for 9% for the year 2012/13.” The major important agricultural export crop is coffee. Other traditional major agricultural exports are sesame, leather, hides and skins, pulses, oilseeds, and chat; recently gold and floriculture have become additional export commodities of the country.

ICT technologies basically divided in to two parts based on period ever since its inventions: as traditional and modern technologies. Print, TV and radio are considered as traditional ICT technologies; while telecommunication services, internet, email, smart phones are considered to represent modern technologies. Traditional ICT technologies in Ethiopia dated back to the beginning of the twentieth century. In reference to Birhanu Olana (2009) as sited in the work of Dereje (2012), the introduction of Aemiro Newspaper, which was hand written at its commencement, in 1902 heralded the beginning of journalism in Ethiopia. The BBC World Service Trust (n.d) Ethiopian Country context Study indicates that Ethiopian Television (ETV) was established in 1964, during the time of Emperor Haile Selassie, with the technical help of the British firm, Thomson. ETV was initially established to highlight the Organization of African Unity (OAU) founding heads of state meeting in Addis Ababa in that same year. Color television was introduced in 1982 by the military government in order to commemorate the founding of the Workers‟ Party of Ethiopia (WPE).

As per the account of Dereje (2012), the first provisional radio station in Ethiopia was inaugurated in1933 in a contract signed with an Italian Company.

The Italians took control of the radio station soon after the Italian invasion of Ethiopia in 1936. Short wave broadcasting was resumed in 1941 and then in the subsequent years Radio Ethiopia broadcast from three locations from Addis Ababa, Harar and Asmara in six languages.

Historically, Emperor Menelik II introduced telecommunications service in Ethiopia in 1894 when the construction of the telephone line from Harar to the capital city, Addis Ababa, commenced. As stated in the work of Bogale (2005), "…Ethiopian Telecommunications Corporation is the oldest public telecommunications operator in Africa. Many important centers in the Empire were interconnected, thus facilitating long distance communication with the assistants or operators at intermediate stations frequently acting as verbal human repeaters between the distant calling parties. Available records of the time have shown that by early 1930‟s a total route distance of about 7,000 kilometers of inter urban network was existed and no less than 170 towns and villages were connected to the network." The telecommunications service has been continued it its stagnated development until 1991. After the downfall of Dergue Regime in transitional period (1991), the government of the Federal Democratic Republic of Ethiopia (FDRE) has carried out an overall restructuring program to change the previously centralized command economy to a free market-oriented one. This was with the aim of making government owned enterprises more efficient and effective as well as encouraging the promotion and participation of the private sector in the country‟s economic progress (History, 2014). However, the telecommunications sector remains in the hands of the federal government.

The Ethiopian Ministry of Information and Communication Technology (MICT) webpage asserts that the development of information and communications technology (ICT) is one of its strategic priorities. "The

endorsed and currently enforced ICT policy is a demonstration of its commitment to the development of ICT both as an industry and as an enabler of socio-economic transformation. The Ministry stresses that the policy stems from the recognition, by the Government, of ICT as the key driver and facilitator for transforming Ethiopia's predominantly subsistence-agriculture economy to an information and knowledge-based economy and society, effectively integrated into the global economy" (MCIT, 2014).

One of the guiding principles of the Ethiopian government ICT policy is "the government shall actively collaborate with the private sector, civil society organizations and communities to promote and encourage the use of ICT towards transforming Ethiopia to a knowledge and information age. The policy also promotes the necessary coordination to establish cooperative practices and spirit amongst various stakeholders for a cost-effective development of ICT" (Ibid).

The federal government of Ethiopia took a series of measures to improve the low level of telecommunications infrastructure in the country. The government invested billions of Birr either through vender financing loan agreements or from its own sources in order to improve the low level of telecommunication development. These programs include the 1.9 billion dollars loan agreement with China's Zhongxing Telecom Corporation (ZTE) in 2007. The government has continued to invest in the communications infrastructure to meet this growing demand. The second phase of vendor credit project between the Ethio Telecom and two Chinese companies - Huawei Technologies and ZTE in the amount of US$1.6 billion from the Chinese Export and Import Bank was approved in 2013 (ethio telecom, 2014).

However, despite the Ethiopian government‟s massive investment in the telecommunications sector, as per Adam (2010) says “there has been no positive movement towards competition over the last two decades. The market remains structured around a monopoly where a single operator provides all fixed, mobile and Internet services and maintains the international gateway service.”

Contrary to the continuous infrastructural effort by the government vendor financing, “the increase in access network, completion of core network, introduction of fixed and mobile broadband access, rolling out of fiber backbone and establishment of links to about 10,000 rural villages was marked by a dramatic fall in the quality of service. Telecommunications revenue has grown only moderately in comparison to investment, at around 16% per annum. The contribution of the communications sector to the economy remained just under 2% – low in comparison to the regional average, which is around 4%.” (Ibid),

Had the quality of mobile, fixed and internet services improved the country and the government would have secured better tax sources, and contributed to a sound overall economic and social benefits. Due to these challenges, the public sector is the loser by holding on to the inefficient and vertically integrated monopoly market structure.

As per the study of 2009/10 the Ethiopian ICT review conducted by Adam (2010), “Ethiopia‟s ICT sector remains far behind the rest of the world. It sits at the bottom of the Information Development Index (IDI) of the International Telecommunications Union, placing 154th out of 159 countries in 2010. Fixed-line tele-density stands at 1.14%, although the number of mobile subscribers

doubled in 2009, when mobile tele-density jumped from 2.5% to 5.5%. This growth is paltry, however, when compared to the global average for mobile subscription of 67% in 2009."

The latest ITU report released in Ethiopia, for the year 2013, indicates that information and communications technology is among the least developed and most expensive in the world. This came in a ranking system, which included 169 countries. One of the benchmarking tools for the measurements is the ICT Development Index (IDI), which measures the level of ICT advancement in 157 countries by combining 11 indicators that focus on three areas – ICT access, ICT use and ICT skills (Mekonnen, 2013).

Ethiopia is currently investing and implementing several ICT projects such as the ICT Park, the Woreda Net Initiative, the Ethiopia Standards Development and Dissemination Programme Developments and the Call Centers all with the aim to reduce the digital divide, attract overseas investment, generate foreign earnings, stimulate growth of domestic ICT industry and create employment and career opportunities for Ethiopian"s. Especially, call centers have enabled the provision of up-to-date and accurate information on government services and have saved customers time and money spent on searching for service information. However, challenges related to the on-going ICTs initiatives such as lack of adequate funding; low ICT high order skills, high cost of internet and landlocked nature of Ethiopia deter development (Gathege & Ruparelia, 2012).

2.8 Role of ICT for Development

For decades, ICT has come to influence daily life round the globe. Be it for financial information, markets, news, general knowledge or simply entertainment, the ease and speed of communication has grown rapidly

(McBriarty, 2011). In this respect, communication is at the heart of ICT; and for many the most obvious manifestation of ICT is with PC‟s and the internet, but ICT is also much more than this.

Moreover, humans are social organisms and hence cannot live without interacting with others, exchanging information, organizing, cooperating, learning, teaching and even playing. Therefore, as Bosch (2012), says "Information and communications technologies (ICTs) reinforce all the social and cultural activities of men and women around the globe and have accelerated cognitive abilities at both the individual and collective levels."

Studies on how ICT can shape and facilitate information processing and transactions among individuals and various groups (i.e. individuals, departments and organizations) have conceptualized the following three roles of ICT–automate, informate, and transform (Zuboff 1988; Armstrong and Sambamurthy 1999; Weill 1992).

The automate role looks at computerizing structured and high-volume information processing activities, with a view to increasing their speed and accuracy, and reducing their cost. The informate role provides reporting and analysis-based organizational information to facilitate control, co-ordination and decision support. The transform role looks at fundamentally changing processes and relationships within an organization or between organizations/entities, by facilitating new forms of information transfer. In this role ICT enable firms to restructure or change their capabilities, processes, and product or service delivery mechanisms (Ibid).

According to Tarafdar and Singh (2011), ICT, "substitute for human effort (automate), augment human decision-making (informate) and restructure human tasks or processes (transform)."

A study by Adam (2010) shows the low level of ICT dissemination in Ethiopia corresponds with its meager contribution to national economic development. Ethiopia‟s Gross Domestic Product has improved significantly between 2000 and 2009 with an annual growth rate of around 10%, while the contribution of the telecommunications sector changed only slightly. Telecommunications revenue was 1.3% of the GDP in 1996, grew to about 2.3% in 2005, and fell again to 1.3% in 2009. In contrast, the investment in the telecommunications sector as a percentage of the GDP has jumped substantially since 2003.

2.9 Role of ICT for Agricultural Commodities Market

Historically, commodity markets have existed for centuries around the world. As noted in the article of Malhotra (2012) "… cash transactions were most common but sometimes forward agreements were also made, for example forward agreements related to rice markets in seventeenth century in Japan." However, most scholars agree that forward agreements date back much further in time. "Forward agreements gradually gave way to futures contracts when the first organized grain futures trading in U.S. began in places such as New York City and Buffalo city" (Ibid).

Modern futures trading began in Chicago city in 1840s. The city was a natural hub for trade, but the trading that occurred was not efficient and organized until a group of Chicago based businessmen formed the Board of Trade in the city of Chicago in 1848. As trading of forward contracts increased, the Board decided that standardizing these contracts would streamline the trading and delivery

processes. “These standardized forward contracts are essentially the first modern futures contracts. The usefulness of futures trading became apparent and a number of futures exchanges came up in the country, the first one being Chicago Mercantile Exchange (CME) in 1919. Led by the innovative thinking of CME, the futures industry has expanded phenomenally to meet the risk management needs of our complex society (oxfordfutures, 2014). ”

The origin of trading is related to the search for someone; buyers must find sellers, and sellers must find buyers. In an effort to find an answer for the question „why do people trade?“ (Gabre-Madhin, 2007), says “…sellers seek buyers willing to buy at high prices, and buyers seek sellers willing to take at low prices. Trading is done across space, across time, and even across form. As long as there is a gap between the sale and the purchase of a product, trading involves risk. And the willingness and capacity to take risk differs greatly across actors in the market. As a result, a commodity exchange is designed to minimize the search costs of trading and to ensure a market for all types of actors.”

Strengthening prior points the author further states “understanding why people trade is critical for establishing a well-functioning market. On the other hand, not understanding the roles and motivations of different types of people in the market and their relationships to each other can lead to a poor design of market institutions. Worse yet, can lead to flawed policies and regulations that ultimately undermine the market” (Ibid). As a symbol of free market, a Commodity Exchange enacts the relationships between all types of market actors, and serves them all in different ways.

Miller, Saroja, and Linder (2013), indicate that agricultural commodities markets apply ICT services to encompass any service that provides stakeholders like suppliers, exporters and farmers, with access to information on pricing of agricultural products (inputs and outputs) and on finding and connecting to suppliers, buyers or logistics providers, such as storage facilities and transport companies. Such services include simple pricing services, virtual trading floors (matching services or full commodity exchanges) and holistic trading services.

ICT serves to provide basic pricing services in commodity markets in which price information of different commodities provided to customers on a regular basis. The market information is provided using different ICT tools like: radio, websites, SMS, price ticker boards are few to mention. The right and timely provision of information enables commodity markets to create price transparency for its customers.

ICT‟s another service is its capacity to create Virtual Trading Floors (VTF) for commodities buyers and sellers. The virtual trading floors are trading platforms where buyers and sellers connect through electronic networks. Unlike the traditional market place, in VTF buyers and sellers do not have to be physically in the same location to make an exchange.

The role of ICT in creating VTF for agricultural commodities was further elaborated by Miller, Saroja and Linder (2013) in their study conducted for the Food and Agricultural Organization of the United Nation (FAO). There are two basic kinds of VTF: matching services, and commodity exchanges. On matching-service VTFs, sellers and buyers connect directly with one another to conduct the exchange of goods available at that moment (the “spot market”

covering today‟s prices). Sellers register their products and delivery schedules, and buyers register their needs. These records are matched by a machine (or human operators referring to databases), which when requested gives either party a range of options to choose from. The second type of VTF is a more conventional commodity exchange in which the suppliers and buyers do not necessarily know one another. The exchange acts as the intermediary that matches the buyer to sellers with the right price and quantity without either side of the transaction knowing who the other is. One advantage of commodity exchanges is that not only is there a spot market of current prices but the exchange also generally has enough information to estimate future prices (p. viii).

According to the excerpt above, Ethiopia Commodity Exchange (ECX) is categorized „somewhere‟ in to the second VTF category: a commodity exchange; with its own distinct characteristics. The ECX is a spot market that anticipates transforming to a futures market in the near future. The exchange is a market platform with an open outcry session where buyers and sellers trade different agricultural commodities like coffee, sesame, wheat, haricot beans and maize.

Hall (2011) "ICT play an increasingly important role in agricultural value chain. Though important, cell phones are not the only ICT being used to improve agriculture. ICTs encompass radio, digital cameras, Geographic Information Systems (GIS), cloud computing, tracking mechanisms, etc."

The five ways in which ICT can help tackle challenges in agricultural value chain development are (Ibid).

1. Pricing and weather information systems

2. Applications (apps) to help buyers manage transactions with thousands of small-scale farmers who supply to them
3. Mobile banking and apps that facilitate quick payments
4. Initiatives to expand the reach of farm extension services through phone, radio, video and sometimes all three
5. SMS or text messaging campaigns for enabling environment advocacy.

ICT helps in gaining and developing confidence between trading partners due to its capability for prompt payment settlements, which otherwise took longer times and created uncertainties in the conventional and traditional trading systems. As ICT is applied widely in to the agricultural sector it offers employment opportunities in the sector.

Basically, ICT enables quick access to information databases that were previously unavailable, best underscores how ICTs have improved agriculture in some places. The basic concept is that ad hoc marketing systems and broader issues of information asymmetries have hampered the economic livelihood of farmers for centuries. In other words, poor communication between producer and buyer results in inadequate planning, and ultimately an unstable marketing environment. So, in as much the same way the global economy is driven by knowledge, agriculture depends on high quality, reliable and efficient information systems.

The main limitations to the adoption of ICTs in agriculture appear to lie in the education levels and cultural backgrounds of rural communities, as well as a lack of motivation stemming from the farmers‟ perception of the scant usefulness of ICTs and their limited digital skills. Complementing the above argument, Rodrigues (2012) stressed that “connectivity is another important

obstacle, despite regional advances. There is little impetus (such as competitive pressure or the needs of suppliers and buyers) to convert traditional systems into more ICT-intensive processes."

2.9.1 Pre-and-post Ethiopia Commodity Exchange Market Information Systems

The agricultural market in Ethiopia, in the same way as that of the agricultural practices, is based on old traditions. As pointed out in the study of Assegid (2010) "agricultural market is characterized by insufficient market information, poor quality, unstable price, lack of trust among trading partners, and uncoordinated markets." He further claims, "The lack of market information is characterized by highly fluctuating prices and huge price overhead on the consumers. Farmers are getting only a small portion of the profit margin due to the existence of multiple brokers at every stage of the market chain." (Ibid)

During the Dergue rule in the late 1970s and 1980s the Ethiopian agricultural market sector; especially the grain trade was tightly controlled by the centrally planned economic system of the time through cooperatives and its parastatal agency, the Agricultural Marketing Corporation (AMC). As cited in Gebre-Medin & Goggin (2005) during this period, policies included "fixed pan-territorial grain prices, restricted private inter-regional grain movements, limited private sector participation, and a producer grain quota. Farmer quotas to the AMC amounted to 10 to 50 percent of the harvest at fixed AMC prices that were consistently below market prices, which had the effect of depressing rural incomes and production."

The scenarios mentioned above also apply to other commodities like coffee. During the pre-1991 period, the Ethiopian coffee sector had been under the

strict control of the government. Private sector participation in exporting coffee was restricted to only supplying coffee at coffee producing regions, and the coffee board of Ethiopia, a government coffee export corporation, performed exports.

In March 1990 a market reform was introduced, and all restrictions on private trade and official prices and quotas eliminated. Subsequently, in 1992, the Transitional Government continued the reforms by eliminating wheat consumer subsidies and downsizing the AMC (Gebre-Medhin & Goggin, 2005). As a result of the market liberalization, the private sector got the opportunity to involve itself in the trading of different commodities, improved market integration, and the reduction of marketing margins for various commodities.

The very low level of economic and infrastructure development in Ethiopia the pre-1991 period, affected farmers, suppliers and exporters due to limited access to transport, and poorly developed telecommunications and storage infrastructure, among others. These weaknesses contribute to increased transport costs as well as physical marketing costs, including storage, handling, etc.

The excerpts below (Gebre-Medhin and Goggin, 2005), revels hidden transaction costs in addition to infrastructure related issues. However, beyond the infrastructural issues, studies also point to the significance of "transaction costs," which are equally or more constraining to trade. These costs, distinct from physical marketing costs, are costs related to conducting or coordinating market transactions between actors, such as the costs of searching for and screening a trading partner, the costs of obtaining information on prices, qualities and quantities of goods, the costs of negotiating a contract, the costs of

monitoring contract performance, and the costs of enforcing contracts. Because these costs are difficult to identify and to measure, they are often overlooked, yet they offer powerful explanations of the persistence of missing markets or of market failures. In fact, these transaction costs also influence the extent of the physical, more observable, marketing costs.

Different literature findings (Bellete, 2013), asserts that the formation of the ECX is one step forward in modernizing the Ethiopian commodities sector. Since the ECX applied different ICT tools to provide timely information, the information obtained would greatly help the exchange members in making timely decisions.

Generally, the market information system of the country was poorly developed and market actors like farmers, suppliers, intermediaries, and exporters were compelled to operate at random which in turn seriously constrained their decision making capability. There is no doubt, therefore, that the launching of Ethiopia Commodities Exchange, in 2008, significantly narrowed a wide gap in market information and communication challenges. The exchange can address the critical information gap by enhancing transparency of product grades, qualities, and marketed volumes in addition to the market-clearing price that promotes self-regulation through a structure that enhances the incentives for preserving order and integrity of the system. Prior to the creation of the ECX broadcasting of commodities, trading activities were limited only to coffee transactions.

The formation of the exchange helped to apply different ICT tools and provided all market participants with more or less equal opportunity for access to information concerning daily opening and closing prices, traded volumes,

percentage changes in subsequent trading dates, available stocks, historical trading data, international commodities prices, any commodity news and researches related to weather, market, industry, finance and the like. Moreover, the exchange planned to setup in and out bound logistical operations in its different regional warehouses upon delivery of purchased commodities in its trading floor.

2.10 The Case of ICT Application in Ethiopia Commodity Exchange Operations

"Almost every form of exchange of goods and services used throughout history still co-exists in today"s world. Types of exchange activity include roadside sales persons, fixed market places, travelling salesmen, retail stores, auctions, commodity exchanges, stock exchanges, online market places, etc. Usually, the form of the market is determined by the type of product being traded" (Messay, 2007).

Once the market is established, market information of this type is, at first, disseminated by word of mouth, as market participants travel to and from the market to other locations. As the market evolves, newspapers that are distributed from market areas also often carry market information. Today radio, telephone links and the web disseminate such information (Ibid).

An important attribute of an exchange, is that it promotes market transparency through generating and distributing information. Through its own functioning, the exchange creates market information about the underlying supply and demand conditions in the economy. Thus, contrary to popular perception, a commodity exchange does not require an external market information system as a pre-condition for its proper functioning. An exchange becomes the market

information system as it implements its function of price discovery based on the public posting of buy and sells orders (Gebre-Medhin and Gogin, 2005).

As cited in its official website (http://www.ecx.com.et) "the ECX is a marketplace, where buyers and sellers come together to trade, assured of quality, delivery and payment." The objectives of the exchange briefly are to:

- *provide market integrity by guaranteeing the product grade and quantity and operating a system of daily clearing and settling of contracts,*
- *enhance market efficiency by operating a trading system where buyers and sellers can coordinate in a seamless way on the basis of standardized contracts,*
- *enable market transparency by disseminating market information in real time to all market players, and*
- *allow risk management by offering contracts for future delivery, providing sellers and buyers a way to hedge against price risk.*

The ECX"s major operational activities as described in the exchange"s monthly newsletter Gebeyachin (2011) include:

- *Trading is on the basis of warehouse receipts issued by ECX operated warehouses - guaranteeing integrity of the products.*
- *Standardized ECX commodity-based contracts - are provided which specify grade, delivery location, lot size, and other contract terms. The contracts will be either for immediate delivery or at a pre-specified date in the future.*

- *A physical trading floor located in Addis Ababa, where buyers and sellers participate in "open outcry" bidding for commodities, with electronic remote access to the trading system.*
- *Electronic price tickers in rural areas where constantly changing market prices are communicated.*
- *An internal system for clearing and settlement of contracts, which guarantees payment against delivery in collaboration with partner banks.*
- *An arbitration tribunal with licensed arbitrators to assure the speedy and professional resolution of any commercial disputes that may arise. Additionally, ECX*
- *Maintains a system of market surveillance where experts monitor the behavior of market actors to protect the market from manipulation, excessive speculation, fraud, or other malpractice.*

In order to successfully achieve its objectives and fulfill its operational duties and commitments, the exchange widely applies different ICT tools in all its departments. The ICT tools applied by the exchange include market information tickers, mobile phone Short Messaging Service (SMS), Interactive Voice Response (IVR) service, and Website (www.ecx.com.et) (Operations, 2014).

2.11 Review of Empirical Literature

Various scholars and institutions have done different empirical studies on information communication technologies. As the study conducted by Dereje

(2006), Ethiopian government formed the Ethiopian Telecommunication Agency (ETA) to regulate the sector and the Ethiopian Telecommunication Corporation (ETC) as operator. The main objective of establishing ETA was to draw regulations to allow competition in the sector by issuing license to operators in the sector. However, the agency couldn‟t come up with substantial measures to promote the development of the ICT sector in Ethiopia, due to lack of enforcing power, low administrative capacity and heavy dependence on the political structure."

Internet access is considered as the main indicator of a country‟s distribution level of ICT, which has significant impact for socio-economic and political developments of a given country. Ethiopia being the least developed and the second populace nation in Africa has the lowest Internet connectivity even compared to the Sub-Saharan countries.

Major telecom and ICT infrastructure indicators took into account the Network readiness Index (NRI), Skills sub-index, Internet users and Internet host to measure ICT development levels in the African continent. A study conducted by Belaynew (2012), shows that Africa‟s networked readiness in terms of network readiness continues to be at the bottom of NRI, with the majority of the region lagging in the bottom half of the NRI rankings. Ethiopia ranked 150th in the world and 31th in Africa. In the Skills sub-index Ethiopia sits at the bottom of skill sub index indicator, which lags behind even by African standard. Ethiopia sits at the bottom with global rank of 149 out of 152 countries.

The study conducted by ITU (2011), revealed that internet users in Africa have the lowest number compared to the other continents which left behind in the

ICT race. Development of the Internet market in Africa is still at infant stage. Ethiopia has small number of Internet users and very small Penetration even by African standard.

Even though Ethiopia has shown encouraging strides in the expansion of utilizing information and communication technology for multi-purposes, like many other developing countries, ICT human resource in the country is in short of the requirements in many organizations. According to (Belaynew, 2012), "an overall shortage of ICT professionals at all levels is observed. The sector faces a significant skilled human-resource shortage for planning, implementation and management of a modern next generation network and its regulation."

One of the major promising prospects about the future of ICT in Ethiopia is the decision by the council of ministers to establish the Information and Communication Technology Park Corporation on March 5, 2010, with a capital of five billion Birr. The council approves the directive for the establishment after it deliberated on the proposal of the Information and Communication Technology Development Agency (ICTDA) (Ibid).

The study presented by Messay (2007), confirmed that the provision of basic market information is a service that aims to increase the efficiency of the ECX and contribute towards overcoming basic issues of market failure based on asymmetrical access to information. As the writer concluded, "Access to spot prices assists [exporters] to make decisions on where to sell their goods and to negotiate for better prices from a position of strength. Traders also use this information to assist in facilitating arbitrage and the distribution of goods."

As a result, it is clear that there is a considerable demand for better market information system and a real need for reliable and flexible technologies to

support such services. However, developing the right product for multiple end-users, such as government, NGOs, the public, is a challenge.

Information is the foundation of the knowledge based economy. Since we are in the era of information and communication technology, at the villages and woredas of rural parts of Ethiopia, it is imperative that, farmers start using ICT tools for information access. ICT is a tool to bring about economic growth and prosperity. Technology and knowledge are now the key factors for the creation of wealth (Ibid).

The importance to have improved completeness, accuracy, relevance, timeliness and appropriateness of presentation are essential factors to increase the effectiveness of the ECX system is revealed by the paper of Asgid (2010). The researcher also underlined that "improving the quality of the information with regard to completeness, relevance, timely and appropriateness of presentation will not only increase the effectiveness of the system but also lead the beneficial … to adopt a better life."

Chapter Three

3. Research Methodology

3.1 Research Method

This research aims to assess the contribution of ICT to the Ethiopia commodity exchange operations, and what benefits and challenges the ICT application created are addressed. The researcher used a descriptive case study to obtain the necessary information.

3.2 Instruments f r of Data Collection

The main data gathering instruments used in this study was questionnaires and interviews. In order to triangulate facts, and enrich the data, interview was conducted with responsible officers at the ECX and MCIT and further document analysis was conducted.

3.2.1 Questionnaire

Data were acquired through personally administered questionnaires instrument to evaluate the contributions of the application ICT in the ECX since its formation in 2008, and opportunities and challenges it created with selected commodities exporters.

The questionnaire has four sections. The first section of the questionnaire consists of questions about general information of respondents, the second section contains question that tried to identify the type of companies the respondents represent, then section three consists questions about the contributions of ICT to the ECX which investigates respondents insight in to a five point Likert scales, and finally the last section is about opportunities and

challenges created by the exchange as the result of ICT application. The questionnaires incorporated open ended and close ended questions with the intention of evaluating the respondents‟ response about ICT applications by the ECX.

3.2.2 Interview

In addition to this, interview guides were prepared and interviews were conducted with ICT/IT department of the exchange and with the Ministry of Communications and Information Technology senior ICT officer. The officials were selected because of the official position they held in their respective offices as ICT experts.

While conducting the interview, the researcher briefly explained the purpose of the interview before forwarding questions to the interviewees and the information they provided is kept confidential and confirmed that the research is conducted for academic purpose.

3.2.3 Sources of Data

In order to undertake this research paper, the researcher used both primary and secondary data. The researcher obtained the primary data through questionnaires and interviews conducted with commodities exporters who have been engaged in the trading activities in the trading pits of the exchange since the formation of the ECX in 2008; and with interviews conducted with chief information officer of the ECX and senior ICT expert at the MCIT.

Data concerning commodities markets and ICT gathered from detailed review of various documents such as books, journals, internet, policy manuals, strategic planning documents, procedures, guidelines, and annual reports

prepared by different organizations. The empirical data were used to support the credibility of the information obtained through questionnaires and interviews.

3.3 Sample Design

As the official website of the exchange, the ECX has 350 members in its trading system encompassing suppliers, intermediaries and exporters (http://www.ecx.com.et/Membership.aspx). These members are categorized as „full members" and „limited members" of the ECX which are engaged in supplying /selling and buying, and finally exporting of commodities.

Sample populations are selected from exporters of different commodities which purchase and export from the exchange including coffee, sesame, and haricot beans. The researcher chose those leading exporters by rank with regard to their export volumes and constituting more than 80% of the aggregate export volumes in metric tons in their respective commodities categories from 2008-2012/13. The researcher applied the Pareto Principle which is also known as the 80-20 rule or the theory of vital few and trivial many; i.e. for many events, roughly 80% of the effects come from 20% of the causes. In this context 20% of sample respondents exported 80% or more while the remaining 80% of sample respondents export the rest. Therefore, the researcher assumes in applying the Pareto principle the selected sample respondents would be:

- in the leading position in their commodity class and confirmed to be in a strong financial position,
- Staying in the business for a relatively longer period of time, and
- Above all if the exporter has been participating in the ECX auction more frequently that resulted in developing stronger relationship with the

exchange and using its ICT services frequently, hence can be a reliable source of information.

As per the information obtained from the Ministry of Trade, the researcher contacted 20% of exporters, in aggregate volume, who exported more than 80% of commodities products. In addition to this, the researcher conducted interview with Chief Information Officer (ISO) of IT division of the ECX, and a senior exert of ICT at the Ministry of Communication and Information Technology (MCIT).

Based on the above-mentioned criteria stated the selection of sample respondents, its type and numbers are presented in table 3.1 below.

Table 3.1 summary of Sample Respondents

	Types of Respondents	*Numbers of Questionnaires*	*Interview Guides*
1	Commodities Exporters	70	
2	ECX – ICT/IT Division	-	1
3	MCIT	-	1
	Total	70	2

Source: Own Survey, 2014

Two methods were applied in collecting the data for the study: questionnaire and interview guides. Seventy questionnaires were prepared and distributed to obtain the reflections of exporters of different commodities trading on the exchanges‟ trading floors. Out of the total questionnaires distributed, 66 respondents completed and returned the questionnaires, representing a response rate of more than 94%. The researcher analyzed, presented and discussed the collected questionnaires in the subsequent chapter. The remaining 4

questionnaires were either not returned in time or considered as incomplete to be of use and, hence, discarded.

3.4 Data Analysis

Since ICT applications and contributions are multi-faceted, and related to many factors, both qualitative and descriptive case studies are applied in order to understand the processed in a holistic manner with different perspectives. Some quantitative data analyses are included using different statistical techniques. Data were collected through distributions of questionnaires to selected commodities exporters, interviews with ICT/IT department officers at the commodity exchange, and personnel at the Federal Ministry of Communications and Information Technology. Personal observations, official documents, websites, and articles were also included. The major areas to be covered are ICT‟s contributions to the public sector in the case of ECX, opportunities and challenges/problems the exchange faced as the result of application of various ICT tools, weaknesses and strengths observed due to ICT application at the exchange, and any policy recommendations and suggestions were also the major focus areas of the research.

Chapter Four

4. Data Presentation, Analysis and Discussion

This chapter is dedicated to the presentation, interpretation, analysis and discussions of data collected from both primary and secondary sources. In this part of the paper, findings on the contributions of Information and Communication Technology to the Public Sector, and with particular emphasis on the Ethiopia Commodity Exchange, were thoroughly assessed and interpreted based on the responses of commodities exporters, the Chief Information Officer (CIO) of the ECX, Senior ICT expert at MCIT, and different secondary data sources. The main findings of the study presented along with data presentation and analysis in various subsequent subsections.

4.1 General Profiles of Respondents

This section describes the respondents‟ general profiles particularly their educational qualification. Table 4.1 represents the basic educational level of sample respondents, who traded coffee, sesame and haricot beans commodities at the ECX auction floor. As shown in the table, 72% of the respondents were first and second degree holders, while 15% had diploma, and remaining 19% had different educational qualifications. The respondent‟s educational level reveals that the sample respondents have good educational background that enables them to exercise effective utilizations and applications of various ICT tools. The response rate is 94%. The educational levels of the respondents also show that exporting companies have reliable human resources that are capable of achieving organizational objectives.

Table 4.1 Educational Level of Sample Respondents

Educational Level	***frequency***	***%***
Diploma	10	15
First degree	34	52
MA/MSC	13	20
PHD	-	-
Others	9	19
Total	66	100

Source: Own Survey, 2014

countries with respect to access to ICT resources could also be seen from a similar perspective.

The current development and future prospects of commodities exporting companies in Ethiopia are mostly dependent up on the country‟s ICT development policy. Private, Unions and Governmental organizations need to be supported by efficient and effective ICT applications and infrastructures. Local exporters are in need of serious support in upgrading their human resource capacity and adopt modern communications technologies so as to be competent with their global counterparts. In order to do so they need to have a good opportunity to access market information, support institutions, funds/loans etc (Bellete, 2013).

Historically, to be one of the top commodity exporters in a certain commodity category has been regarded as in indication of financial strength, strong customers‟ base, capacity to execute contractual obligations, and effective utilization of human resource. As the result since these companies would be regular clients to the exchange and develop frequent contacts and relationships as well; in that case they would be capable of giving account about the exchange and their business transactions genuinely.

Sample respondents utilize various ICT services provided by the exchange to facilitate their business activities. For instance, every organization uses the goods receiving notes, which are supported by the exchange‟s electronic communication services between the head office, and its regional warehouses, exporters collect their purchases from the regional warehouses when the warehouse delivery unit receives the kind of commodity, grade, quantity and all relevant information confirmed by the electronic goods receiving note

electronically. When samples are graded and approved in the case of commodities, they are received by the quality inspection departments at the respective warehouses, and then the warehouse would inform the trading department in Addis Ababa through email that they were accepted and ready products could be traded at the auction. As a result exporters could browse and download daily and historical market data every day for various purposes.

4.2 ECX"s Applications of ICT and Contributions Realized

Qualitative data analysis that is evaluated in comparison with the theory of expected benefits of the exchange with responses and interviews conducted with sample respondents, CIO of the ECX, MCIT"s senior ICT expert presented in subsequent paragraphs.

A study conducted by Gathege and Ruparelia (2012), affirmed that "the Government has approved, in principle, the national ICT4D policy as a framework for facilitating Ethiopia"s ICT-led socio-economic development programme, targeting the development of information and a knowledge-based society and economy. As such, the Government of Ethiopia (GoE) under the Ministry of Capacity Building drafted the National ICT for Development (ICT4D) Five-Year Action Plan for Ethiopia (2006-2010) initiated by the United Nations Development Programme (UNDP)."

According to the GoE (2010) science, technology and innovation policy that focuses on promoting and facilitating the use of ICTs the following objectives were forwarded to:

- facilitate public administration and service delivery, including the introduction of electronic government (e-government) and governance,

- promote ICT development at all levels of the educational system,
- use ICT for the development of sectors such as agriculture, health, industry and trade;
- develop telecommunications and physical infrastructure,
- facilitate private sector development including electronic commerce (e-commerce), electronic trade (e-trade) and foreign direct investment,
- promote research and development in ICT,
- establish enabling legal and regulatory frameworks for smooth development of the ICT sector (GoE ICT4D, 2006-2010).

The above stated objectives of GoE are cornerstones in promoting public-private partnerships and enhancing the role of e- governance in various sectors and this in effect would create an opportunity for the advancement of ICT and commodities trading inseparably.

In reference to the CIO of the exchange, the basic contributions of the exchange emanate from its conception and objectives that it plans to serve and achieve as an entity. The IT division strongly shares and is committed to executing the objectives of the exchange. Initially the exchange was established to solve the economic disorder in the commodities markets that existed in Ethiopia for long. The following point from the study conducted by Gebre-Medhin and Goggin (2005) supports this opinion:

> *In the Ethiopian context, the presence of prohibitively high transaction costs, evidenced by the lack of sufficient market coordination between buyers and sellers, the lack of market information, the lack of trust among market actors, the lack of contract enforcement, and the lack of grades and standards, implies that buyers and sellers operate within narrow market channels (Ibid).*

The other main contribution of the exchange to the Ethiopia agricultural commodities market is its application of high quality and sophisticated technological ICT support systems to facilitate the daily transaction activities, warehousing and delivery services, clearing and settlement processes and other various operations needed for the successful facilitation of the exchanges‟ operations. The exchange has seven divisions, which encompass Strategy, Operations, Compliance, Finance, Human Resources, and Comptroller and IT divisions. As per the interview conducted with the CIO of the exchange, the IT division has six units each with its own manger and staffs. The units utilize the support of diverse ICT infrastructures to fulfill their duties. The following are brief descriptions of each unit in the IT Division:

Applications Development Unit:

This is engaged in developing of in-house software applications for business and non-business purposes. The business software intended for the exchange‟s trading activities, while the non-business software is designed for Human Resource, payroll and other corporate duties.

Network Infrastructure and System Administration:

This unit is engaged in setting-up Local Area Network (LAN), internet, system administration, email and related systems. This unit controls division‟s servers and operate data centers.

Quality Assurance and Testing Units:

The main duty of this unit is to check and assure the quality of software developed by the Applications Development Unit. It also serves as a bridge between the user and developer departments.

IT Security:

The unit secures the overall safety and security of the institution‟s networks, computers, and various devices from internal and external treats.

Data Warehousing Unit:

This unit produces information from historical data that would help management for long term decision making purposes. In addition to that it provides trade facilitation services for auctions on the exchange trading floor.

IT Application Support:

The duty of this unit is to provide „first aid‟ assistance whenever problems arise, and undertake maintenance works.

The exchange IT division is utilizing different kinds of ICT infrastructures to keep up with the high standard of the commodities markets. The ECX applies various kinds of ICT infrastructures technologies like: Network Infrastructure, Servers and Storage, Key Software Systems, Security Systems, and other Technologies.

The IT division strategy and IT solutions accommodated wide array of business operations including warehousing, clearing and settlement, and central depository which were not typically core functions of an exchange. While the trend is currently changing, almost all exchanges are built for futures trading as opposed to spot trading which the ECX was designed to. According to Gebeyachin (2011), the business needs made it difficult for ECX to buy such trading platform from providers of such solutions. As per the IT division head, initial attempt to acquire a commodity exchange trading platform that met part

of ECX business needs came at a price of over 10 million dollars in 2008. Therefore, the decision to build in-house ICT infrastructure for such kind of spot exchange platform was imminent. In reference to IT Corner of the exchanges newsletter of 2011 (ibid), "the journey to build the Local Area Network (LAN) and Wide Area Network (WAN), data center infrastructure, market data dissemination, spot-based exchange software to enable inventory management, warehouse receipting, central depository, clearing and settlement, and trading operations began in early 2008 with a mission to go live in April, 2008. As planned, these IT capabilities were built and the exchange began trading on April 24, 2008. Since then and despite continued electrical and telecom outages, the exchange never cancelled scheduled trading sessions and managed to settle all trades on without any default by leveraging the ECX IT capabilities."

The exchange is a new venture in itself that successfully applies various types of ICT tools and replaces the traditional coffee auction and other commodities traditional markets. As a result, the exchange contributes significantly to its clients and stakeholders by providing various channels of alternative information sources in an effort to meet its own objectives of providing efficient, transparent and orderly marketing system (Bellete, 2013). As per the CIO, the IT division has programs that enable to identify the figures of clients that browse the exchanges‟ webpage, number of users of SMS or the Interactive Voice Recognition (VIR) services. Based on the publication of Gebeyachin (2011), "the SMS & IVR (Interactive Voice Receiver) services which ECX has launched are … disseminating real time market information to users. Figures indicate that the IVR system is currently receiving 20,000 thousand calls each day." There are also more than 100 price tickers installed at

different locations across the country to provide real-time market data to the public.

According to the institutionalist theory, institutions are important because they limit the scope of search of economic choices, thereby reducing transaction costs. They also reduce uncertainty by providing enforcement mechanisms. While market competition remains the core mechanism for increasing efficiency, the theory shows economic and non-economic institutions play a key role in shaping the economy. In addition to as per the study of (Kirkman et al. 2002) the economic development of a county encompasses the institutional strengths of different organizations, particularly in the telecommunications and ICT sectors; social conditions, such as education level and the incorporation of ICT in education; and the extent to which ICT has been incorporated into business and government activities. ECX as a public organization is trying actively to incorporate various technologies in its operations in an effort to contribute to overall economy of the country.

The economic history of today‟s advanced economies shows the importance of government organizations in preventing and correcting market failure. A network of organizations standing watch over the market dynamics are ready to intervene, primarily in financial and capital markets, not only with regulatory capacity but also as economic actors in their own right. Moreover, state organizations play a significant role in shaping the political rules and social norms that drive, or at least influence, the decisions of economic actors (Avgerou, 2003).

According to the research questionnaires findings, all exporters use more than one of the available various ICT tools to meet their company needs. Sample

respondents use one or all services like Short Messaging Service (SMS), VIR Services, website, print and electronic media to get daily trading prices and volumes of sales of commodities traded at the exchanges‟ trading floors. Sample respondents and other individuals and companies visit daily the exchanges‟ official website for various reasons. The CIO of the exchange confirmed that daily commodities market reports also broadcast by the national TV and Radio and some private FM Radio Stations for the public awareness.

Another major ICT tool used by sample respondents are the print media, since the sample respondents are frequent participants in the trading sessions and the major exporters they utilize print documents presented by the ECX regarding auction sales prices, brochures, bulletins and newsletters prepared by the exchange.

These services would enable any customer to easily access general market information and details in their specific personal accounts, even if they are at a remote location where telephone network is available (Ibid).

4.2.1 Views of Commodities Exporters about the Contributions of the Exchange Application of ICT

Hereunder, table 4.2, present the Likert scale data analysis that tries to evaluate the contributions of the exchange application of ICT. There are seven questions in the table presented to evaluate the level of agreement of sample respondents in five scales: from Strongly Agree (SDA), Agree (AG), Neutral (N), Disagree (DA), to Strongly Disagree (SDA). Numbers of sample respondents who agree with the statement presented and evaluated against its percentage points. Then it is interpreted in light of the possible contributions of the applications of ICT tools by the exchange to support exporters‟ business activities.

Table 4.2 Likert Scale Questions for Evaluating the Contribution of the Exchanges‟ ICT Application

		SAG		AG		N		DA		SDA		Total
		F	%	F	%	F	%	F	%	F	%	
1	ECX delivers timely market information.	13	23	23	40	21	37	5	9	4	7	66
2	ECX provides accurate market information.	9	16	24	42	21	37	9	16	0	-	63
3	Exporters can collect their contracts from regional warehouse without facing any communication problems.	6	11	7	12	13	23	24	42	15	26	65
4	ECX promotes exporters actives in its websites, publications, and other ICT tools.	4	7	8	14	16	28	27	47	11	19	66
5	Exporter‟s decision making capacity improves as a result of the information provided by ECX.	9	16	15	26	21	37	13	23	8	14	66
6	ECX ICT tools improve exporters forecasting capability.	8	14	14	25	22	39	11	19	11	19	66
7	Commodity exporters‟ sales increase as the result of various ICT publications and information provided.	3	5	7	12	15	26	25	44	16	28	66

SDA - Strongly Disagree, DA - Disagree, N - Neutral, AG - Agree,
SAG - Strongly Agree. Source: Own Survey, 2014

Concerning the data presented in table 4.2, for the question if the *„ECX delivers timely market information*‟, 40% and 23% respondents agree and strongly agree, respectively, that the exchange delivers timely market information. While smaller numbers, i.e. 5 (9%) and 4 (7%) of the respondents said that they disagree and strongly disagree, respectively, to the statement. However, the figures in the table indicate that 89% of those who took part are in favor of the idea that ECX delivers timely market information. From the researcher‟s personal observation point of view, the exchange posts the market information on timely basis. Anyone visiting the exchange‟s webpage latest trading prices

can realize that volumes traded and grade of commodities are posted online while trading is going on.

According to Fekru, Market Information Dissemination Manager at the ECX, on his presentation with media partners in 2010 states that the ECX generates market information in the form of price, trade summaries and commodity contracts. Apart from this, it also disseminates weighted average prices of commodities, grades and volumes of commodities traded through various channels. Despite this, trade summaries are dispatched in the form of bulletins on Daily and Monthly bases involving market analysis, commentary and comparisons of ECX traded commodities prices to comparable commodities in international reference markets. According to the manager "by having ECX market information every day, farmers discover prices for their produce, traders know the market trend, policy makers get a clear picture of the market and consumers know what the market offers and for how much."

With respect to the statement that „*ECX provides accurate market information*", more than half were positive that 42% and 16% of the respondents agreed and strongly agreed, respectively, while 37% and 16% were neutral and disagreed, respectively. The majority of the respondents believed that the market information of the exchange content was correct and the various ICT tools deliver these information in an appropriate way.

Coming to the statement „*Exporters can collect their contracts from regional warehouse without facing any communication problems"* many respondents opposed the idea that 42% of the respondents disagreed and 26% strongly disagreed. In the meantime 23%, 12% and 11% of the respondents remained neutral, agreed and strongly disagreed respectively, to the proposition.

Many commodities exporters were convinced that long time was required to collect their purchased commodities form the regional warehouses. The basic problem was frequent network connection breakdown between Addis Ababa head office and the various regional warehouses. Subsequently, most exporters complain that the delay incurs cost to their operations, seriously affecting their reputations, and forced them for delayed export and reducing their chance of doing repeated business dealings with their customers.

Access issues remain paramount in any discussion about the potential of digital government. Even as the total global online population increased 20 percent between 2000 and 2001 (to 514 million users), only about nine percent of the world‟s population enjoys regular Internet access (Mistry and Jalal, 2012). .

However, Internet access is not the only issue in the digital internet connection. Access to other ICT related resources should also be taken into consideration. Developing countries also have a mixed scenario of Internet access among their populations. As broadband connections are not universally available, simple internet connections also need to rely primarily on fixed (main) telephone connections.

An overwhelming number of exporters are skeptical concerning the idea that *"ECX promotes exporters activities in its websites, publications, and other ICT tools"* effectively. The exchange has some coverage regarding its client‟s activities, achievements and other related issues. 47% and 19% of the sample respondents disagreed and strongly disagreed with the statement that the exchange promotes exporters activities on its ICT based technologies. The remaining sample respondents; 28%, 14% and 7% were neutral, agreed and strongly agreed, respectively. The exchange conducts interviews with some

clients on specific issues. However, with its use of a multitude of ICT tools, reaches, and wider reputation it should have promoted exporters links and contacts with different users of its services both locally and internationally. The exchange should sponsor and organize local and international symposiums, seminars, conferences, trade fares and shows.

The statement that „*Exporter's decision making capacity improves as a result of the information provided by ECX*" received mixed reactions from exporters. Some 37% of the respondents were not sure as to whether or not the exchange contributes to the decision-making capacity of exporters. However, 26% and 16% of the respondents agreed and strongly agreed, respectively, with the statement. On the other hand, 23% and 14% of the respondents disagreed and strongly disagreed, respectively.

However, as the research findings indicate with other open-ended questions, many respondents visit the website, or use SMS or use other services of the exchange to obtain important trading information, confirming that the market trend of a specific commodity, the price, volume or grade plays a vital role in business dealings with their buyers. Broadly, the information provided by the exchange, which is local market information, support exporters" decision-making capacity when exporters try to do businesses internationally.

The importance for to develop and enhance decision making capacity through applications of technological advancements that have been credited for playing a significant role in the globalization of trade, communication, and life styles. Vasarhelyi and Alles (2008) suggest a new business model based on technological advancements. They state that: "Businesses are taking the lead to adapt and to also accelerate the development of the "now" economy, through

the widespread adoption of integrated company software such as enterprise resource planning systems (ERP), modern communication technologies that ensure that workers are on the job 24/7/365, and monitoring systems that give a greater range of managers the ability to track and control key business processes."

In the same table, the response for *„ECX ICT tools improve exporters forecasting capability"* shows that 25%, 14% and 39% of the respondents agree, strongly agree and neutral, respectively. On the other hand, 19% and 19% of the respondents disagree and strongly disagree, respectively to the statement. Historical data on commodities prices, volumes and grades contributed positively for forecasting the trends of the market.

„Commodity exporters" sales increase as the result of various ICT publications and information provided" received a higher percentage of disagree and strongly disagree, 44% and 28% respectively, while only 12% and 5% agreed and strongly agreed with the statement. The majority of the respondents say sales have nothing to do with the exchange"s ICT applications. Although the information provided by the exchange supports decision-making processes, the increase or decrease of sales depends on marketing skills, client base, negotiation and communication skills, and bargaining capacity of every exporter.

By way of summary, table 4.2 reveals that the provisions of timely and accurate market information by using the applications of ICT have shown positive contributions of ICT to improving exporters" decision-making and forecasting capacity. On the other hand delayed receipt of purchased commodities from the regional warehouses, unsatisfactory promotion and lack of support on the

diffident ICT tools and publications of the exchange have negative effect of dragging and reducing the possible positive contributions ICT to the operations of the exchange.

E-governance, which is a paradigm shift over the traditional approaches in Public Administration, means rendering of government services and information to the public using electronic means. This new paradigm has brought about a revolution in the quality of service delivered to the citizens. It has ushered in transparency in the governing process; saving of time due to provision of services through single window; simplification of procedures; better office and record management; reduction in corruption; and improved attitude, behavior and job handling capacity of the dealing personnel (Monga, 2008).

4.3 Opportunities and Challenges that Commodities Exporters Faced because of ECX's ICT Application

4.3.1 Opportunities

According to Hall (2011), "one of the basic opportunities of ICT is it enables quick access to information databases that were previously unavailable, best underscores how ICTs have improved agriculture in some places."

The major findings are focused on the applications of ICT so as to creates an opportunity for exporters to make an informed decision making chance based on the provision of market information dissemination service of the exchange. Exporters operate in the extremely volatile and dynamic world market environments. A result many commodities exporters would have the opportunity to follow the local and international market movement and

fluctuation and are able to act accordingly based on information relating to the global market trends.

Information at hand about local market trends shall keep exporters away from making excessive commitments to international buyers. When local supplies dwindle, exporters shall be cautious from entering in to binding contractual agreements with foreign buyers. This will keep exporters from stock-out situations when an agreed upon shipment period arrived later.

On the other hand, the assimilation of Sesame and Haricot beans in to the trading floor allowed exporters to have access to these products‟ market information. These include *inter alia*, price, different grades, and qualities etc. Before being traded on the exchange floor, the traditional marketing systems of sesame and haricot beans (like other agricultural products) have witnessed that the "Ethiopian mark
business across short distances, with few partners, in few markets, and with limited storage, implying that opportunities for expanding market activity were limited (Gabre-Madhin and Goggin 2005).

Another major opportunity revealed by the study is that the application of ICT enables exporters to have a well-organized historical price levels and daily price levels of different grades of a single product especially for haricot beans and sesame trading. Before the formation of the exchange the marketing and trading activities of these two products were very localized and scattered.

The intensive application of ICT systems of the exchange create an opportunity for a smooth and faster clearing and settlement of transactions that is fast and reliable between seller and buyer.

In addition Ethiopia has some ICT related opportunities that can be utilized in the dissemination of agricultural knowledge and information to the users. The most notable opportunity is the presence of ICT infrastructure called the Woredanet that can be easily extended to reach most of the rural farmers and to further strengthen the research-extension-farmer linkage. At present, almost all woredas have the infrastructure that enabled them to be connected to the network and have access to internet, telecommunication, video conference and databases at national level. In addition, more than half of the kebeles in the country were linked to the network, (Adam, 2010). Thus, the presence of such modern ICT initiatives can be considered to be a good opportunity to enhance the flow of commodities market information in Ethiopia. It is also can serve as an important medium by the ECX to expand and effectively provide a wide range of other extension services including health and nutrition extension services and conducting civic education programs.

4.3.2 Challenges

According to 63% the sample respondents, the market data provider on the website is not user friendly and designed in unappealing format and it is hectic for the technologically well versed users. As 74% respondents confirm, the exchange revised the format at different times, however processing historical market data content is not convenient and very time consuming when one tries to have historical market data. Empirically, the daily market data is available only till the next working day before noon, i.e. 11 AM. Then after, the data is removed and replaced by the new trading session prices and volumes reports, which has yet to be completed once the daily trading is closed. However, in other globally well-known trading websites like the *www.data.tradingcharts.com/kc* the daily price, volume and stock positions of

specific commodities are presented with the summary of the previous day trading information.

In relation to the above-mentioned concerns, 75% exporters noted the website of the exchange presents only daily and historically traded market data but does not show the stock positions at the exchanges‟ hand. This affected exporters‟ capabilities and hinders them from making a well-informed and planned decision in their approach of the global volatile commodities price and trading scenarios.

The other challenge sample respondents face according to the research finding is, 65% of sample respondents raise their concern that the exchange increased their cost after its formation in 2008, and they cited the reason was because of the different additional activities included during post ECX period. Examples are exporters now expected to collect their purchases from some 17 warehouses across the producing regions. While 71% of the sample respondents raised their concern that the ICT infrastructure constraints created additional delays in collecting purchased commodities for the regional warehouses. On the average it took some 15 days to collect; as a result it created delays in shipment periods and claims from overseas buyers for late shipments.

These concerns were also confirmed by the study of Gemoraw (2011), conducted with coffee exporters. According to him "…most of the interviewed exporters reported an increase in their transaction costs in this period. The major reason cited by…exporters [about the increase] …in their transaction costs is that there are extra costs involved in taking the coffee from the ECX warehouses to the exporters‟ warehouses after a trade transaction has been completed."

One of the notable mentioned impacts expected from the commodity exchange like ECX is a reduction in the different costs involved in trading commodities at the exchange trading platform. In this regard, different responses were reported exporters. This is also confirmed by the draft Strategic Study for the Ethiopian Coffee Sector by Herausen (2013), high transport cost, whereby transport to Addis via ECX warehouses can turn out to be twice as expensive as export transport to Djibouti, with 3 times the distance to the regional warehouses.

The CIO of the exchange admitted the existence the communication problem between head office and regional warehouses but assumed the major reason to be due to various telecom, ICT infrastructure, and electric power supply problems. According to the Revised Rule book (2010) of the exchange, every commodity should be collected from its regional warehouse within 10 days; but sample respondents complain that it takes much longer time, 15 days and more to get their products from regional warehouses. As the result, delayed shipments to overseas buyers occur. In consequence local exporters would be in disadvantaged position due to rising cost of operations compared to their competitors in other countries, exporters may face risk missing continuous business opportunities with important clients, could face financial penalties for not meeting shipment deadlines. In addition to this, the reliability of their service may be at risk. Due to these problems the exchanges‟ objectives of creating an efficient, transparent, and orderly marketing system would be jeopardized.

In this regard, the active use of e-governance enables utilizing IT to guide and restrain collective activities of groups that manage formally and informally processes and institutions in private as well as public enterprises enable them to

accomplish their functions/roles effectively. These functions/roles are as per Mintzberg, (1971) classified managerial roles into three categories: interpersonal, informational, and decisional. IT can reduce internal management (governance) costs. As firms grow in size and scope, agency costs or coordination costs rise because owners must hire more and more managers to supervise, monitor, and coordinate activities of employees. IT, by reducing the costs of acquiring and analyzing information, permits organizations to reduce agency (and hence governance) costs because it becomes easier for managers to oversee a greater number of employees.

However, the most daunting challenge, raised by 67% of the respondents, is the frequent breakdown of telephone and internet connections. The breakdown creates a very difficult situation when exporters are in need of the compiled information of trading activities. This affects the activities of exporters negatively and also their decision making processes. Hall (2010), further strengthening the importance of information and communication between buyer and seller, emphasizes that "poor communication between producer and buyer results in inadequate planning, and ultimately an unstable marketing environment. So, in as much the same way as the global economy is driven by knowledge, agriculture depends on high quality, reliable and efficient information systems."

According to UNDP (2010), the major challenges of access to ICT can be divided into two: access to ICT infrastructure and access to ICT services. The access to ICT infrastructure in Ethiopia is still very low despite some noticeable improvements registered in recent years. According to the country diagnostic report of the World Bank issued in March 2010, the coverage of ICT in Ethiopia is one of the lowest in Africa. For instance, the coverage of GSM

signal is about 10 percent of the population compared to the 48 percent benchmark for low income countries. Similarly, at the time of assessment, the Internet bandwidth benchmark for low income countries is about 20 times higher than that of Ethiopia. Studies have argued that the monoplic market structure that exists in Ethiopia‟s fixed, internet and mobile markets is one of the major factors behind the slow development of its ICT sector.

In spite of being a necessary condition, access to ICT infrastructure by itself is not sufficient for the dissemination of information to occur through it. Access to ICT infrastructure must be accompanied by access to ICT services. In this respect, the other challenge is how to make ICT services both affordable and available in venues or modes that are convenient to users.

Availability of venues refers to the presence of various access points particularly information kiosks, tele-centers, call-centers, and so on in a manner that is accessible to the majority of the users. These services are not adequately available and accessible in Ethiopia. A recent study has pointed out that there are only three public tele-centers per 10 thousand people and even existing service centers are unlikely to be sustainable, and extension to rural areas is a challenge due to lack of funds (Chekol, 2009). Furthermore, affordability poses a great challenge to accessibility of ICT service, especially among subsistent farmers.

However, as per following excerpt from the official website of the MCIT and the confirmation of the higher expert of the ministry, “the Ethiopian Government has made development of information and communications technology one of its strategic priorities. ICT in Ethiopia at present is in its

early stage of development. The major indicators pointing to the low level of ICT development are (MCIT, 2014):

1. The absence of appropriate legal and regulatory frameworks;
2. Limitations in telecommunications infrastructure and low level of internet services penetration;
3. Lack of organized data and information resources, and poor accessibility to those that exist;
4. Lack of skilled human resources coupled with low ICT literacy; and
5. Under developed private sector.

These constraints present the government with bona fide challenges, but also opportunities, for all accelerated development of ICT in Ethiopia. Thus, the government of Ethiopia recognizing the importance of Information and Communication Technology development has adopted the ICT policy and strategy" (MCIT, 2009).

The CIO of the exchange accepted the breakdown of communication between the head office and its regional warehouses, which are some 17 warehouses in number for different commodities in various parts of the country. However, the CIO believed that his institution is working with different stakeholders mainly with Ethio-telecom to solve the frequent network problems. In addition, from the more than 250 Price Tickers installed across the country only 40% are operational, while the remaining are not functional for technical reasons. As the result, the public in these areas are detached from market information.

Even if the exchange provides SMS and VIR services in many cases it is very difficult to use mobile phones to get market information as a result of very difficult network and infrastructure constraints. As per the Senior ICT expert at

the MCIT, however, asserts that the exchange is one of the pioneers in applying a wide variety of ICT tools intensively in its operations. The MCIT acknowledges the existence of telecommunication and ICT based problems in the country and particularly related to the services of the exchange. Since the exchange operates independently, the MCIT have no direct communications with it. However, the ministry is working with Ethio-telecom and different stakeholders as one of the ministry‟s major objectives are to develop and enforce standards, legal and regulatory frameworks for the development of communication and information technologies and services.

In the meantime, almost all sample respondents, 97%, use printed daily market reports from the exchange in case of website accessing problems related with network system failure form the national telecom monopoly.

Chapter 5

Conclusions

In light of the basic questions raised at the beginning of the study and the major findings presented in the previous section of the paper, the following conclusions have been made.

The Ethiopian government made market reforms in the beginning of the 1990s. The government believed that these market reforms were to solve inefficiencies of local agricultural products marketing system that continued in the subsequent years. Some of these inefficiencies included: long chains of transaction between the farmer and the consumer; poor access to reliable and timely market information; and small volumes of products of highly varied quality offered by individual smallholder farmers. One of the major contributors to poor market access is the lack of reliable and timely market information on input and output process as well as on input and output quantity and quality. This absence substantially increases transaction costs and reduces market efficiency. For any one crop, the marketing chain consists of multiple intermediaries; each taking a margin at every stage of the chain, and price variation in space and time are often large and erratic. So to solve these problems the ECX went operational by utilizing modern ICT-based technologies.

Efficient execution of e-governance is extremely important for the governments in their respective area to align their services with the changing needs of citizens. The rise of information and communication technology over the years has made the e-governance initiative common in most countries (Flak, Olsen, and Wolcott 2005).

The exchange is able to adopt successfully ICT based technologies, and support the transaction process between suppliers and exporters, payment settlement activities with banks, and different stakeholders after its formation in 2008.

The ICT‟s contribution has been through the provision of market information, 84% of sample respondents confirmed that the exchange provided them with timely and accurate market information. The exchange applied technologies like SMS, VIR Services, electronic and print media, price tickers, and so on services including additional methods of disseminating market information. The main beneficiaries are different stakeholders like smallholder farmers but traders, suppliers, exporters, different interested companies, government offices, and individuals benefit from the information collected and disseminated.

Research findings show that 79% respondents agreed that the exchanges‟ ICT supported technologies contributed and helped exporters‟ decision making process by providing integrated daily marketing reports and data. As a result, exporters got an opportunity to secure an informed business decision-making environment.

The exchange is able to provide trading platform for sesame and haricot beans, despite their reputation for scattered marketing systems and give an opportunity for exporters to reduce market information soliciting costs.

The ICT based technologies were designed to increase market opportunities, minimize risks, enhances information sharing, and create real time collaboration. However, there are some challenges identified that could over shadow the effort to modernize the traditional agricultural marketing system.

The design and layout of the website of the exchange is not user friendly and attractive as per 63% of respondents as per the research findings. Besides, it is not easy to obtain historical data of commodities trading information.

According to confirmation of 65% of the research respondents delayed receipt by purchases from different regional warehouses are due to failure of electronic communication, electric power disruptions, and weak telecommunication services affect commodities exporters affected negatively. The delay creates increased exporters‟ business operating costs despite the main objective of the exchange, which is designed for efficient, transparent, and orderly marketing system.

The major challenges to the ICT-based technologies are that users of these services find it very difficult to get access or connected to the website and also to use SMS and VIR Services due to persistent communication breakdowns emanating from the telecom monopoly.

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Appendices

Appendix 1: Questionnaire for Commodities Exporters

Addis Ababa University

School of Graduate Studies

Faculty of Business and Economics

Department of Public Administration and Development Management

I am conducting a study to obtain information for my theses research work to be submitted in partial fulfillment of the degree of Masters of Arts in Public Administration and Development Management. This questionnaire is prepared to assess the Contributions of **"Information and Communication Technology in the Public Sector: The Case of Ethiopia Commodity Exchange."** Hence, I would kindly request you to respond to the subsequent questions. The information that you provide will be kept confidential and will only be used for my own academic purposes. Your co-operation in providing your honest reflection will be very much appreciated.

Thank you!

General Guidelines:

- Please put "√" for your choice in the box provided.
- Open- ended questions are answered by writing on the space provided. If the space is not sufficient, please use the back page of the questionnaire.

I. General Information

1. Please specify your educational status:

☐ Diploma ☐ First Degree

☐ MA/MSC ☐ PHD

Any other _____

2. Please indicate your work experience in the commodity market sector:

☐ 1-3 Years ☐ 4-6 Years

☐ 7-10 Years ☐ >10 years

3. Please indicate your position in your firm:

☐ General Manager ☐ Deputy Manager

☐ Trader ☐ Operations Manager

Any other_____

II. Type of Organization/Firm

4. What kinds of commodities is your firm buying and exporting form the ECX?

☐ Coffee ☐ Sesame ☐ Wheat

☐ Maize ☐ Haricot Bean

5. If your firm engaged in exporting of more than one commodity items, please specify

_____.

6. How long have your firm been exporting the above selected commodity/ies?

☐ 1-5 Years ☐ 6-10 Years

☐ 11-15 Years ☐ >15 years

Any other_____

7. What kind of firm is your firm?

☐ Private ☐ Union ☐ Government

8. Is your firm member of the ECX?

☐ Yes ☐ No

9. If the answer for above question is no, how did your company trade in the ECX?

_____

_____

III. Contributions of ICT to the ECX

10. What kind of ICT tools does your organization use?

☐ Telephone/SMS ☐ Electronics Media

☐ Website broadcasting ☐ Print Media

Any other _____

11. Please state the kinds of services you receive by using the above stated ICT tools?

_____

_____

Please rate the following statements by ticking („√") against its corresponding lines.

No	Item	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
12	ECX delivers timely market information.					
13	ECX provides accurate market information.					
14	Exporters can collect their contracts from regional warehouse without facing any communication problems.					
15	ECX promotes exporters actives in its websites, publications, and other ICT tools.					
16	Exporter"s decision making capacity improves as a result of the information provided by ECX.					
17	ECX ICT tools improve exporters forecasting capability.					
18	Commodity exporters" sales increase as the result of various ICT publications and information provided.					

IV. Opportunities and Challenges created by exchange as the result of ICT application

19. Please state the major opportunities your organization gets from the ICT tools that the exchange applied?

_____

_____

20. What are the Major problems you face specially in the services provided by the Exchange?

_____

_____

21, what are the mechanisms you use to solve these problems?

_____

_____

22. Do your complaints handled appropriately by the exchange?

☐ Yes ☐ No

23, what measures are taken to reduce the complaints?

_____

_____

24. What could be done by the ECX to improve the services it rendered?

What possible solutions do you suggest?

_____

_____

Appendix 2: ***Interview Guide for the Ethiopia Commodity Exchange (ECX)***

Addis Ababa University

School of Graduate Studies

Faculty of Business and Economics

Department Of Public Administration and Development Management

I am conducting a study to obtain information for my theses research work to be submitted in partial fulfillment of the degree of Masters of Arts in Public Administration and Development Management. This questionnaire is prepared to assess the Contributions of **"Information and Communication Technology in the Public Sector: The Case of Ethiopia Commodity Exchange."** Hence, I would kindly request you to respond to the subsequent questions. The information that you provide will be kept confidential and will only be used for my own academic purposes. Your co-operation in providing your honest reflection will be very much appreciated.

Thank you!

1. What are the specific objectives of the Information and Communications (ICT/IT) department?
2. What type/kinds of ICT tools does your organization/department apply to facilitate its work/task?
3. What type of ICT supported services do you give to exporters?
4. What are the contributions of the applications of ICT to your organization?
5. Do you think that your objectives regarding the application of ICT have been realized?
6. If the answer for question number 5 is yes, how? If it is no, why?
7. Are your ICT tools designs and formats user friendly?
8. Do you promote exporters work, achievements etc using any of your ICT tools? If so, please specify?

9. Does your organization have a method/system to know the extent to which users visit or access its websites? Media? Price tickers? Etc.
10. What opportunities did your origination/department realize as a result of ICT applications?
11. What challenges do you face as a result of the application of ICT tools? Please specify?
12. What methods did you devise to solve these challenges?
13. Would you kindly identify your organization‟s strengths and weaknesses in relation to ICT system?
14. In the meantime, what opportunities and threats do you see for the further value adding effort in enhancing ICT?
15. What do you suggest for the better realization of your objectives?

Appendix 3: Ministry of Information and Communications Technology (MCIT)

Addis Ababa University

School of Graduate Studies

Faculty of Business and Economics

Department Of Public Administration and Development Management

I am conducting a study to obtain information for my theses research work to be submitted in partial fulfillment of the degree of Masters of Arts in Public Administration and Development Management. This questionnaire is prepared to assess the Contributions of **"Information and Communication Technology in the Public Sector: The Case of Ethiopia Commodity Exchange."** Hence, I would kindly request you to respond to the subsequent questions. The information that you provide will be kept confidential and will only be used for my own academic purposes. Your co-operation in providing your honest reflection will be very much appreciated. Thank you!

1. What are the specific objectives of the Ministry of Information and Communications (ICT)?
2. What kind of specific objectives does your Ministry have to support commodities exporters?
3. What type/kinds of ICT tools does your Ministry introduced to facilitate commodities exporters activities?
4. What kind of contribution did the application of ICT create to Ethiopian commodity sector? And, in particular to the Ethiopia Commodity Exchange (ECX)?
5. Do you think your objectives regarding the application of ICT achieved?
6. If the answer for question number 5 is yes, how? If no, why?
7. What challenges did the Ministry face in its effort of adopting ICT?
8. What opportunities did the Ministry assume in the applications of ICT?

9. What strengths and weaknesses does your Ministry take into account in the application of ICT to the public sector?
10. Are there any anticipated by the Ministry that undermines the positive contributions of ICT to the nation‟s economic development effort?
11. What policy recommendations does your Ministry forward to add values to the use of ICT to the public sector developments?

Declaration

I, Samson Bellete Mengistu, hereby declare that this thesis entitled "**Information and Communication Technology in the Public Sector Case Study: the Ethiopia Commodity Exchange"** is my own original work and that all the sources of materials used for this study have been identified and acknowledged as complete references. This thesis has not been previously submitted in full or partial fulfillment for any degree in any university or any other recognized educational institution.

By: Samson Bellete Mengistu (ID: GSE/4540/04)

Signature: _____

Date: _____

Confirmed by Advisor

BT Costantinos (Ph.D.)

Date_____

Signature_____