

**A PROJECT REPORT SUBMITTED TO THE SCHOOL
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Market Information System and the Ethiopia Commodity Exchange

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This is to certify that **Mesay Zegeye** has worked on “**Market Information System and the Ethiopia Commodity Exchange**” under my supervision. This work is original in nature and it is suitable for submission in the partial fulfillment of the requirement for the Degree of **Master of Business Administration.**

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Abstract

The majority of Ethiopian population lives in the countryside and makes a living by producing agricultural products. Farmers in the rural areas sell their agricultural products to merchants from the cities at very low prices. This is because farmers do not have the option of getting market information of agricultural products in the major market places other than their localities. Due to this fact, the livelihood of farmers is deteriorating day by day.

This has a direct impact on the Ethiopian economy since the economy strongly depends on agriculture. To improve the livelihood of farmers, it is important that they get market information to enable them sell what they have at reasonable and fair prices. Hence, efficient and practical way of providing up-to-date market information to farmers is highly needed.

The Ethiopia Commodity Exchange is established to create a better market environment for farmers as well as consumers. ICT is one of the three pillars of Ethiopia Commodity Exchange. Using tools of ICT, one can provide accurate market information to farmers and traders in rural areas.

The majority of the population in the rural areas is not educated enough to use computers. In addition, implementation of computer based Market Information System may require installing computers and computer network in the villages of rural Ethiopia. This kind of venture can be very expensive. Furthermore, the necessary infrastructure, such as electricity, for setting up computer networks is not available in most rural parts of Ethiopia. Hence, a solution which is not too costly to implement and at the same time easy to use is needed.

In this work, Ethiopia Commodity Exchange's existing market information requirements were collected and studied. Relevant country wide information was explored. In addition, experiences of other commodity exchanges were investigated. During the system study process, nine Market information System solutions were identified. In order to select a feasible Market Information System solution, eight reasonable evaluation criteria were developed. The evaluation criteria developed took into consideration the educational situation of the country, technological trend, the existing infrastructure of the country, and the requirements of Ethiopia Commodity Exchange. By applying the evaluation criteria, out of the short listed solutions one is selected. Finally, a high level system design of the selected Market Information System is developed and proposed.

The proposed Market Information System employs Interactive Voice Response based technology. This technology combines the simplicity and accessibility of telephones with the intelligence and sophistication of computers. The proposed Market Information System is accessible via the public telephone network. A farmer who knows how to make use of a telephone can use IVR based systems to retrieve market information. Farmers and traders can interface with the system through the telephone keypad by sending telephone digits. The system has prerecorded messages. Based on the input from the end user, the system plays back the appropriate prerecorded market information. Furthermore, the system has a capability of building new messages from the existing once; hence dynamic market information can be played back to the end user.

CHAPTER 1 - Introduction

The majority of Ethiopian population lives in the countryside and makes a living by producing agricultural products. Farmers in the rural areas sell their agricultural products to merchants from the cities at very low prices. This is because farmers do not have access to major market places in Ethiopia. In addition, farmers do not have the option of getting market information of agricultural products in the major market places other than their localities. In spite of this fact, it is ironic that the Ethiopia's economy depends on agricultural products that come mainly from the primitive rural areas of the country.

Due to this fact, the livelihood of farmers is deteriorating day by day. This has a direct impact on the Ethiopian economy since the economy strongly depends on agriculture. To improve the livelihood of farmers, it is important that they get access to major markets in the country and get up-to-date market information to enable them sell what they have at fair prices.

Ethiopian farmers bring only 30 percent of what they produce to the market. Subsistence farming is way of life in rural Ethiopia. Studies show that Ethiopia produces more maize than the total maize production of Kenya, Uganda, and Tanzania combined. Equipping Ethiopian farmers with information on the types of agricultural products they can grow and the price they can sell their products can help improve livelihood of farmers. Furthermore, it will bring profits back to the agricultural sector helping it to grow. In spite of the fact that Ethiopia is the second largest maize producer, Ethiopian farmers are getting poorer and poorer. (Baldauf, 2007)

Currently, Ethiopia is on track of establishing its first organized commodity market. The success of a commodity exchange depends on the proper installation of the following three key functions,

- The legal and regulatory fundamentals underlying the market mechanism,
- The financial services provided through the Exchange,
- Information and communication technology (ICT) that supports the marketing system.

(Gebre-Madhin, 2006)

Using tools of information and communication technology, one can provide accurate market information to farmers in the rural areas. However, the majority of the population in the rural areas is not educated enough to use computers. In addition, installing computers and computer network in the villages of the countryside can also be very expensive. Furthermore, the necessary infrastructure, such as electricity, for setting up computer networks is not available in most places.

Selecting the right market information dissemination tool is critical for the success of the new commodity exchange that is going to be established here in Ethiopia. In this study, several variables have to be taken into consideration before coming up with a viable solution.

1.1. Statement of the Problem

Market Information System is a very important part of any commodity exchange. Currently, from Ethiopia Commodity Exchange's side, there is some research work that is being done to determine as to which type of Market Information System should be implemented when Ethiopia Commodity Exchange becomes fully operational. However, Market Information System envisaged by Ethiopia Commodity Exchange has low area of coverage, high technical skill requirement and heavily relies on the WoredaNet infrastructure. This work tries to

address the short comings of Market Information System that is planned to be implemented by the Ethiopia Commodity Exchange.

1.2. Objective of the Project

The general objective of this project is to investigate and recommend suitable Market Information System for the Ethiopia Commodity Exchange. The Market Information System solution proposed in this study could help support farmers as well as contribute to the economic development of the country. In this work, Market Information System implementations of other commodity exchanges were investigated. The educational situation, technological infrastructure, etc of Ethiopia were given due attention in the selection process of a Market Information System for the new Ethiopia Commodity Exchange.

In order to meet the general objective of this project the following key activities must be carried out:

- a) Literature review and study Market Information Systems of other commodity exchanges
- b) Conduct need assessment to determine Market Information System requirements of Ethiopia Commodity Exchange
- c) Analyze and propose a feasible Market Information System solution that can be implemented in Ethiopia

1.3. Limitations of the Project

In this study the experience of other commodity exchanges was reviewed. However, due to time and financial constraint no site visit was made.

1.4. Delimitation of the Project

This project focuses on the conceptual requirements of Market Information System that can be implemented by the Ethiopia Commodity Exchange. However, it does not cover detailed technical design and implementation procedures of the proposed Market Information System.

1.5. Methodology

This assignment requires two different approaches, the first one is assessing the current situation of our country and the other is usage of systems analysis tools like interviews, document review, etc. to extract Market Information System requirements of the Ethiopia Commodity Exchange.

Designing a formal questionnaire and analyzing the data by statistical software has not been found appropriate for this work. Instead checklist approach is selected. Before interviews are conducted checklist was prepared to ensure the required information is in fact collected.

Other tools used in this project include semi-structured interviews, direct observation, focus group discussions, etc. Review of relevant literature shall also be conducted. The envisaged agricultural commodity exchange is new to Ethiopia. Desk research are carried out to help clarify many of the involved issues and sharpen the direction of the study. Internet is used as a source of most of the literature relevant to the issues involved in the study. Other literatures from various institutions are reviewed as well.

The following are the major activities of this project:

Task I - Literature Review

- Literature review on what commodity exchanges are
- Examine the significance of having market information
- Review the history of commodity exchanges in the world
- Review relevant country wide information
- Review of the Ethiopia Commodity Exchange
- Experiences of other commodity exchanges are investigated

Task II – Problem Analysis

This is the first and base stage of the project. At this state, requirement elicitation is conducted. Potential problem areas of different market information systems are identified. Technological, social, and educational elements are identified and examined. Alternatives are explored.

- Information and data collected is analyzed
- Possible candidates of Market Information System solutions are identified
- Evaluation criteria is developed
- Applying the evaluation criteria, the best alternative is selected by giving due attention to the existing educational, social situation and technological infrastructure available in Ethiopia

Task III – Proposed System Design

- Propose a Market Information System
- Conduct a high level system design of the Market Information System proposed

1.6. Significance of the Study

Currently some preliminary research work is being done by Ethiopia Commodity Exchange to determine its Market Information System requirements. This work will help provide additional information for the expert team that is engaged in the selection of Market Information System of the new Ethiopia Commodity Exchange. This research work is not intended to replace or duplicate the work that is being done by the Ethiopia Commodity Exchange but rather its outcome can help to complement what is already being done by the Exchange.

1.7. Organization of the Paper

The final project report will have has five chapters. The first chapter shall discuss issues like significance of the study, objective of the study, limitations and delimitation to the study. The second chapter shall deal with review of literature. The third chapter shall focus on the discussion of problem analysis. The fourth chapter shall recommend and layout the proposed system design. The last chapter is the conclusion.

CHAPTER 2 - Literature Review

A commodity is a product having monetary value. A commodity is an item that can be manufactured, produced, purchased, sold, and consumed. Commodities are primarily the products of agricultural sector of the economy. Natural resources such as crude oil, natural gas, different types of minerals, etc can also be considered as commodities (MCX- Training Department, 2006).

A market can be defined as a place where buyers and sellers meet to exchange goods for money. Commodity exchange is essentially an organized market place, which is governed by rules that are established by stakeholders of the market. It is a way to bring together all the market players and try to achieve a maximum level of competition (Gebre-Madhin, 2006).

A commodity exchange is an institution or system where people who want to sell can come and make an offer of product that they want to sell. Simultaneously, people who want to buy are also making bids. The exchange as an institution matches the buyer with the seller. This matching process results in the market price that becomes known to all (Gebre-Madhin, 2006).

2.1. History of Commodity Markets

Commodity futures trade first started about 6000 years ago in China, with rice as the commodity. Commodity futures trading is a natural outgrowth of the problems of maintaining a year-round supply of seasonal products like agricultural crops. In Japan, commodity futures trade started in the 17th century. Forward markets also reportedly started in Antwerp around the same time. However, major developments in commodity derivatives trading occurred in Chicago in the middle of the 18th century (Babcock, 1999).

Japanese, merchants stored rice in warehouses for future use. In order to raise cash, warehouse holders sold receipts against the stored rice. These were known as "rice tickets." Eventually, such rice tickets became accepted as a kind of general commercial currency. Rules came into being to standardize the trading in rice tickets. These rules were similar to the current rules of American commodity futures trading (Babcock, 1999).

In the United States, commodity futures trading started in the grain markets in the middle of the 19th Century. The Chicago Board of Trade was established in 1848. Back then, Chicago was already a commercial centre with a good rail and telegraph network. Around this same time, good agriculture technologies were developed in the area, which led to higher wheat production. Therefore, Midwest farmers came to Chicago to sell their wheat to dealers who, in turn, shipped it all over the country (Babcock, 1999).

In the 1870s and 1880s the New York Coffee, Cotton and Produce Exchanges were born. Today there are ten commodity exchanges in the United States. The largest are the Chicago Board of Trade, The Chicago Mercantile Exchange, the New York Mercantile Exchange, the New York Commodity Exchange and the New York Coffee, Sugar and Cocoa Exchange. Worldwide there are major futures trading exchanges in over twenty countries including Canada, England, France, Singapore, Japan, Australia, New Zealand and India. The products traded range from agricultural staples like Corn and Wheat to Red Beans and Rubber traded in Japan (MCX- Training Department, 2006).

Farmers and dealers slowly started entering into contracts for forward exchanges of grain for cash at a pre-determined future date, so the farmers could avoid the trouble of transporting/storing wheat at a high cost if the price was not acceptable. This system was

suitable for farmers as well as dealers. The farmer knew how much he would be paid for his wheat, and the dealer knew his costs of procurement well in advance (Babcock, 1999).

The biggest increase in futures trading activity occurred in the 1970s when futures on financial instruments started trading in Chicago. Futures trading in foreign currencies such as the Swiss Franc and the Japanese Yen were also started. Also popular were interest rate instruments such as United States Treasury Bonds and T-Bills. In the 1980s futures began trading on stock market indexes such as the S&P 500 (Babcock, 1999).

The various exchanges are constantly looking for new products on which to trade futures. Very few of the new markets they try survive and grow into viable trading vehicles. Some examples of less than successful markets attempted in recent years are Tiger Shrimp and Cheddar Cheese (Babcock, 1999).

2.2. The Need for Market Information

Almost every form of exchange of goods and services used throughout history still co-exists in today's world. Type of exchange activity include roadside salesmen, 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.

All these markets need to attract the business of producers, consumers, traders and others. These market participants need to be confident that the market will not cheat them. In order to have this trust, the market needs to provide a mechanism that allows clients to check the price paid for the goods they buy or sell on the market at the same or nearly the same as the price

paid by other users of the market at the time of their transaction. This is called the “*Price Discovery*” function of the market (Milgrom, 1999).

In a simple street market, the seller of an item can approach a trader based in the market and negotiate a price for the item. The seller, however, has no idea of the price the trader will pay to the next person offering the same item. Furthermore, the seller has no way of knowing the price at which the trader will, in turn, sell the item to a consumer (Milgrom, 1999).

One way of overcoming this problem is the public auction. Here, producers bring their produce for display at a fixed location. An auctioneer, who is independent of both buyers and sellers, is employed by the auction house to conduct the transactions. Potential buyers of a particular item indicate the price they are prepared to pay, and the buyer who is prepared to pay the highest price for the item will win the auction. All this is done with all the buyers present as well as the seller (Milgrom, 1999).

These features of the auction make transaction transparent – everyone can see the transaction taking place and can note the price paid for a particular quantity and a particular quality of the product. This allows potential sellers to get a good idea of the price they will receive when they sell their goods, and prevent some forms of cheating (Milgrom, 1999).

All the types of market described above not only need to offer market users the assurance that they will not be cheated, but also need to give potential clients market information which might include the volume of trade conducted and the price paid for the commodities (Milgrom, 1999).

Some markets have no means of informing potential clients about the details of their transaction. Buyers and sellers are often reluctant to make the effort to bring their goods to market if they have no idea what price they will get for them. This reduced the overall volume of trade, decreases production and increases waste, which has a negative effect on a country's economy.

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, market information is also often carried by newspapers that are distributed from market areas. Today such information can also be disseminated by radio, telephone links and via the web.

2.3. The Ethiopia Commodity Exchange

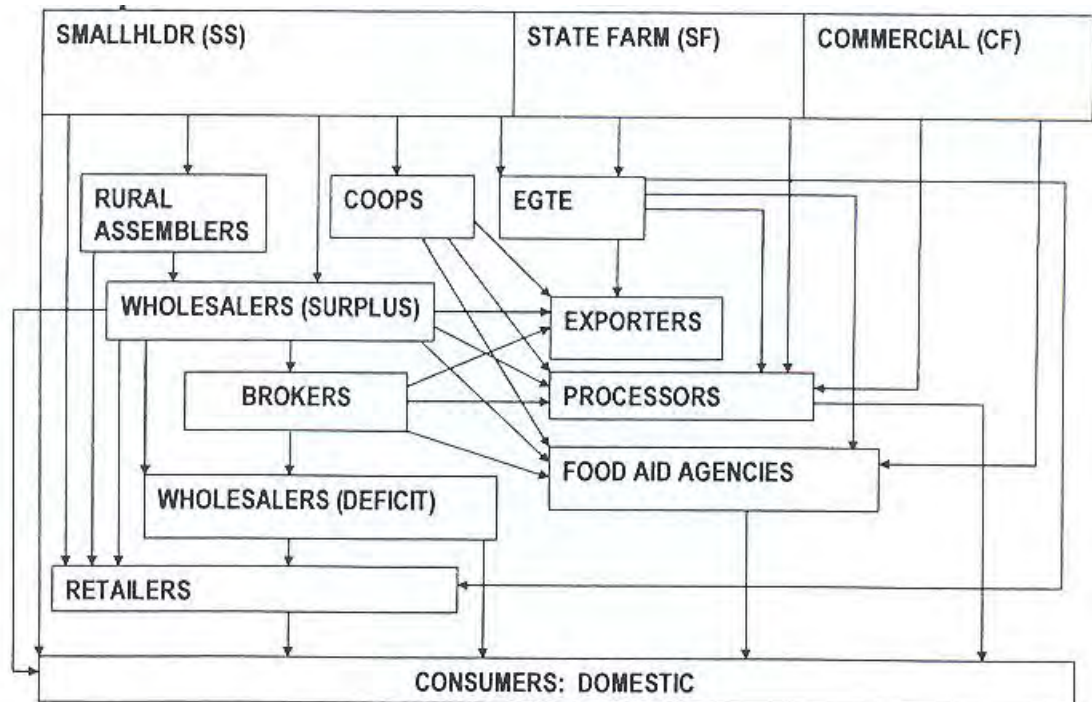
Agriculture is the backbone of Ethiopia's economy. To bring millions of Ethiopians out of poverty requires a fundamental change in the way agriculture is done. Substance agriculture should be replaced with technology-driven and market-oriented production.

As Ethiopia is poised to transform its agrarian economy, so too must Ethiopia's marketing system take the country into the new millennium. It is time to enter the modern age of globally connected trading systems, relying on technology and knowhow, while tailored to Ethiopia's realities and conditions. It is time to forge a new partnership between the private and the public in the new arena created by market liberalization.

Currently, Ethiopia's marketing system is traditional and backward (See *Figure 1*). It is mainly characterized by high costs and high risks of transacting, forcing much of Ethiopia

into global isolation. The vision driving the Ethiopia Commodity Exchange is to revolutionize Ethiopian agriculture through a dynamic, efficient, and orderly marketing system that serves all.

Figure 1 - Current Grain Market Structure



Source: Ethiopia Commodity Exchange

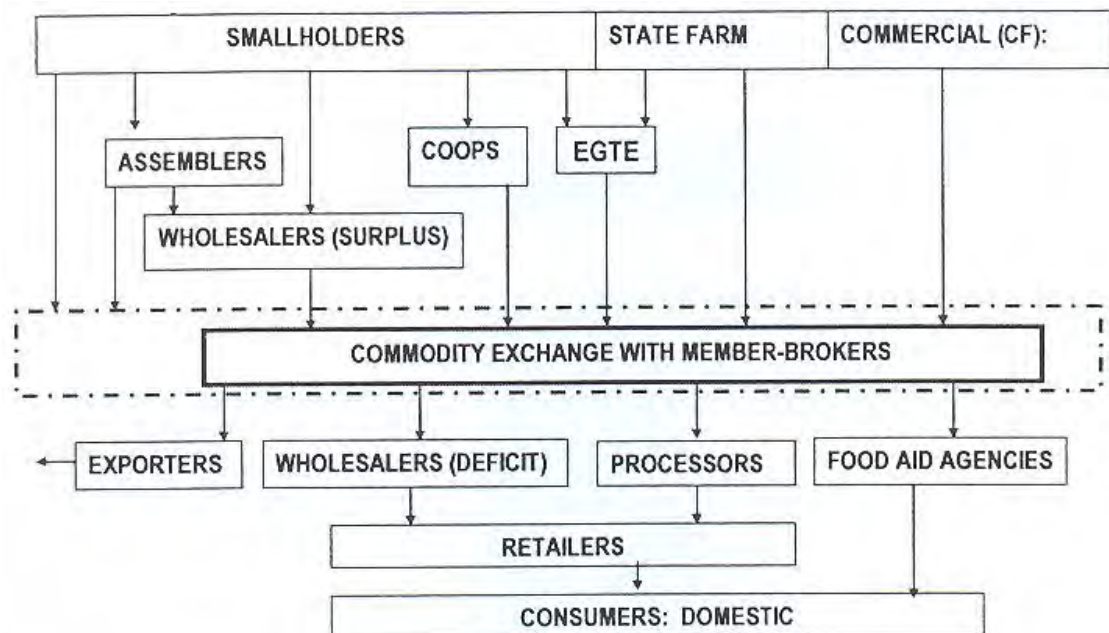
Commercialization of smallholder agriculture is core pillar of poverty reduction strategy. Ethiopia needs to capitalize on the gains of recent rapid economic growth. In addition, there is a very large domestic market for agricultural products. The export market has also exhibited growth in the past years.

The Ethiopia Commodity Exchange will have a significant impact on smallholder farmers livelihoods. Farmers will be better positioned to negotiate prices given the market information

transparency. In addition, the introduction grading systems will encourage farmers to pay attention to the quality of their product. Farmer are able to get market premium for valued added to the product after harvesting. Farmers will also have the flexibility of accessing not only the local but also the national market. When futures trading begin, farmers will be able to lock in prices through future contracts hence minimizing the risk associated with price fluctuation.

Ethiopia Commodity Exchange vision is to provide a low-cost, secure marketplace to benefit all stakeholders. One of the advantages of having this exchange is that it guarantees the integrity of a product that is sold in the exchange. Trading is done on the basis of warehouse receipts issued by Ethiopia Commodity Exchange operated warehouses. These warehouses will be responsible for grading, weighing and certifying the product they receive. Once all formalities for certifying a commodity is fulfilled a warehouse receipt will be issued.

Figure 2 - Grain Market Structure with Ethiopia Commodity Exchange

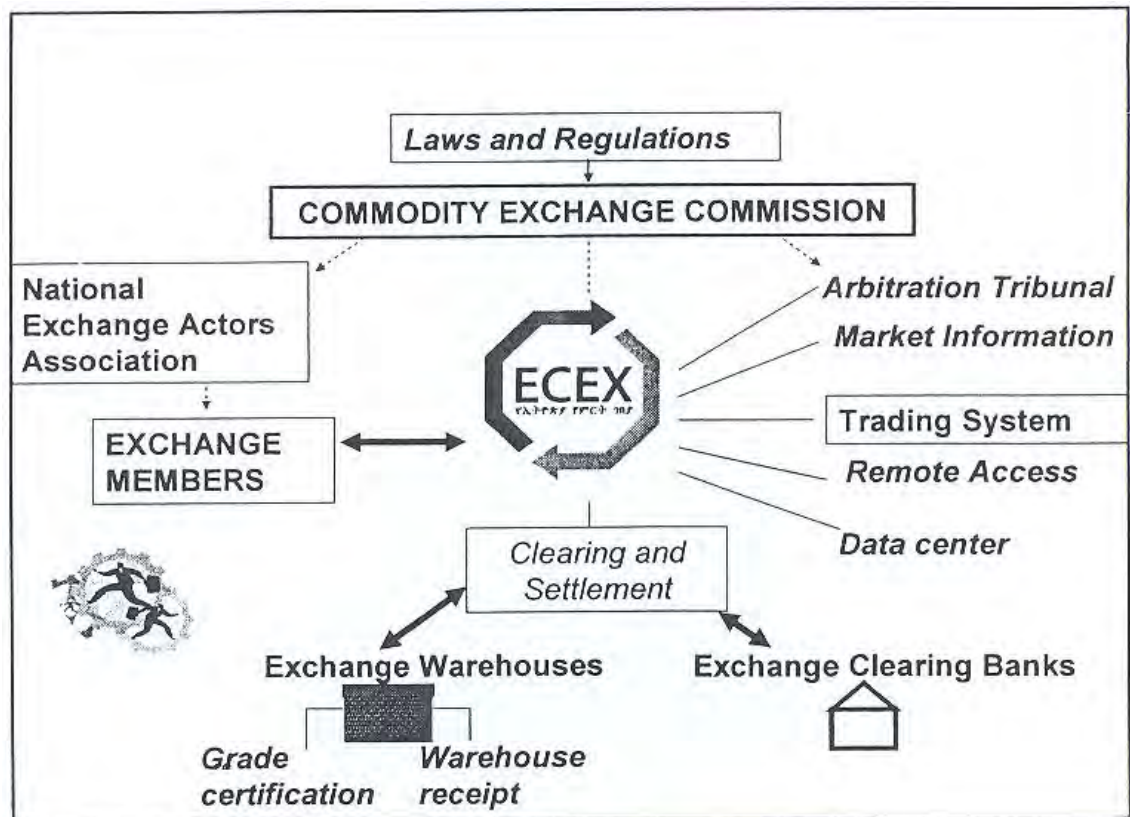


Source: Ethiopia Commodity Exchange

Ethiopia Commodity Exchange also provides standardized commodity based contracts. The contract specifies the 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. When Ethiopia Commodity Exchange becomes operational it will start by offering contract for immediate delivery.

Ethiopia Commodity Exchange plans to implement two types of trading system at the physical trading floor located in Addis Ababa. Buyers and seller can participate in “open outcry” bidding for commodities or they can use one of the electronic remote access trading system. *Figure 3* shows the general organization of Ethiopia Commodity Exchange.

Figure 3 - Organization of Ethiopia Commodity Exchange



Source: Ethiopia Commodity Exchange

2.4. Review of Relevant Country Wide Information

Commodity market in Ethiopia depends on several external and internal factors that are relevant for its successful operation. In this section external and internal environment and infrastructure availability to implement Market Information System requirements of the Ethiopia Commodity Exchange are investigated. The descriptions in this section are also thought to provide an important input for designing Market Information System for Ethiopia Commodity Exchange.

2.4.1. Review of Relevant Government Policies

The establishment of the Ethiopia Commodity Exchange is in line with the formulation of the government's Rural Development Policy. The government of Ethiopia has set as its primary economic development objective the rapid and sustainable transformation of rural areas. The set of policies formulated by the government are based on the frame work known as "Agriculture Development Led Industrialization" or ADLI (Government of FDRE, 1989).

It is believed that ADLI offers Ethiopia better solutions to its social and economic development needs. ADLI as a policy framework is derived from a thorough analysis of the structural distortions of the economy resulting in the declining and so fast economic growth and the review of the best international practices in bringing swift economic development. Even though ADLI stressed the rapid transformation of the agricultural sector, it also provides for the needed linkage and subsequent qualitative change of the industrial sector (Government of FDRE, 1989).

ADLI as a policy framework and economic development strategy is adopted by the government due to four major reasons

- In the current Ethiopian economic context it allows to register rapid and sustainable economic growth
- It helps benefit the overwhelming majority from achieved economic development – because ADLI targets more than 85% rural population of the country
- ADLI as a strategy ensures the country to get rid of foreign relief assistance and hunger in the shortest possible time
- It facilitates the advent of a strong and developed market economy (Government of FDRE, 1989)

Thus, the country's rural development policy that was formulated in the year 2001 is founded on the ADLI framework. The agricultural sector has been given in the mentioned policy document a fundamental role and is a key player in the implementation of the rural development policy (Government of FDRE, 1989).

One of the tasks outlined in the rural development policy of the Government is the creation and consolidation of an efficient agricultural marketing system. Furthermore, the policy document makes clear that such a system should have thrust in two core areas, namely,

- a) Establishment of a quality and standards system for agricultural products
- b) Improving the market information delivery system in the economy (Government of FDRE, 1989)

Hence, the establishment of the Ethiopia Commodity Exchange having a strong agricultural Market Information System is a major policy issue for the government of Ethiopia and has been given a strong emphasis in the rural development policy document (Government of FDRE, 1989).

2.4.2. Review of Remote External Environment

International market presents several opportunities to Ethiopia Commodity Exchange. One of the major opportunity for commodity trader and exporters in the international market is duty free export areas for products originating in Ethiopia. These include the Common Market for Eastern and Southern Africa (COMESA), African Growth and Opportunity Act (AGOA), and the European Union's "Everything but Arm's" (EBA) initiative.

2.4.2.1. Common Market for Eastern and Southern Africa (COMESA)

The history of COMESA begins in December 1994 when it was formed to replace the former Preferential Trade Area (PTA), which had existed from the earlier days of 1981. COMESA's economic history and background its main focus is on the formation of a large economic and trading unit that is capable of overcoming some of the barriers that are faced by individual states. COMESA's current strategy can thus be summed up in the phrase 'economic prosperity through regional integration'. COMESA has 20 member states with a population of over 385 million. Trade facilitation and trade liberalization measures of this regional organization are bearing fruit. Intra-COMESA trade has grown from US\$834 million in 1985 to US\$1.7 billion in 2006. As a result of COMESA traffic facilitation measures, transportation costs have been reduced by a factor of about 25% and efforts are underway to reduce them further. COMESA has established several important institutions including the PTA, Trade and Development Bank, the COMESA Leather and Leather Products Institute located in Addis Ababa. With the establishment of the exchange, which is posing to become the east African agricultural commodity market hub, COMESA provides a very attractive market opportunity for commodity traders in Ethiopia (COMESA, 2007).

2.4.2.2. The African Growth and Opportunity Act (AGOA)

On May 18, 2000 President Clinton signed into law the Trade and Development Act of 2000, containing the African Growth and Opportunity Act (AGOA). The Act provides unprecedented Potential opportunities for Ethiopia (Office of the United States Trade Representative, 2007).

Ethiopia is not only an eligible country for AGOA but also a highly favored nation vis-à-vis the eligibility criteria. Many people assume that AGOA is only about textiles and apparel. But this is not true. Regarding the export results of the year 2003, the official AGOA report states that U.S. Textile and apparel imports more than doubled to 803 million and agricultural products grew 385 to \$212 million. This shows that many AGOA eligible countries have succeeded in exporting other goods. In 2006, Ethiopia exported under AGOA amounted to USD 2.2 million. But this is nothing when compared with other beneficiary countries such as Kenya exporting USD 169 million. Again, AGOA can be a good means to benefit grain exporters of Ethiopia. The establishment of the commodity market will increase Ethiopia's share of trade in AGOA (Office of the United States Trade Representative, 2007).

2.4.2.3. The EU's "Everything but Arms" Initiative (EBA)

The Cotonou Agreement governs the trade relations between the EU and 76 African, Caribbean and Pacific countries, including all of sub-Saharan Africa. In fact, 86% of trade under Cotonou is with Africa, representing about 40 billion Euros per year. There is also a complete liberalization for 4/5 of the agricultural products. In total, 96% of EU imports from sub-Saharan Africa enter the EU duty and quota-free (World Institute for Development Economic Research, 2003).

Since 2001, the EU adopted its “Everything but Arms” initiative, which extends duty free and quota-free access to all products origination in the least developed countries, excepts arms and ammunition. This includes all industrial and agricultural products including sensitive items like meat, dairy, cereals, fruits, and vegetables. This initiative is of particular interest to Ethiopia, as 34 of the 49 least developed countries are African. An important conclusion is thus Ethiopian exporters can enter the EU market. The establishment of commodity market in Ethiopia will encourage European companies to come and purchase agricultural goods from the exchange facilitating export trade in the country (World Institute for Development Economic Research, 2003).

2.4.3. International Trends in Computing Technology

Technology Trends are widely recognized forces or patterns of change that can be used to infer or predict the future of technology. The following technology trends have been identified as having a significant impact on the business and architecture requirements of Ethiopia Commodity Exchange’s Market Information System.

- **Widespread Access to Internet** – The availability and acceptance of moderately priced computers, coupled with rapid growth of private tele-centers in almost all major towns of the country, has led to an increasing number of citizens who use the Internet. Consequently, government offices that web-enable their services will be position to meet the accessibility demand of citizens (Tanenbaum, 2003).
- **Internet and Intranets as dominant communication vehicles** – The Internet and the Intranet have become the dominant communications vehicle for publishing information and for conducting business in both the public and private sector. This trend will make business solutions that are not compatible with the Internet obsolete. Internet-only solutions for delivering services, however, will not completely replace

other service delivery mechanisms because many citizens who are most in need of government services do not have Internet access (Tanenbaum, 2003).

- **Requirement for Secure Transactions across the Network** – As more business-to-business and business-to-customer transactions are processed over the Internet, there is a widespread realization that security is vital. Technologies like encryption, public key infrastructure, and digital signature are becoming increasingly viable and reflect the growing demand for absolute authentication, privacy and access control. The growing demand for pervasive security will drive rapid advances in security technologies and require significant investment by the public sector in proven security systems (Tanenbaum, 2003).
- **Network Centric Computing** – The need to share information and work cooperatively, regardless of time and distance, is causing electronic document handling, electronic commerce, automated workflow and collaborative computing to continue to increase dramatically. Increased use of electronic work processes will escalate the demand for network connectivity and communication bandwidth. This trend elevates the importance of networks and makes them critical factors in the success of business processes (Tanenbaum, 2003).
- **Electronic Commerce Expectations of Business Partners** – Business are discovering that electronic commerce is a viable and productive way to transact business across supply chains. Many businesses now require their partners to transact business electronically. Consequently, state and local governments, which are not positioned to conduct electronic business, will find themselves and their citizens at a significant and potentially costly disadvantage (Tanenbaum, 2003).
- **Emergence of Web Browser as Client of Choice** – The web browser has become a common element on all workstations. Deployment of applications using a web

browser as the client is widely acknowledged to be an efficient choice. This approach mitigates problems inherent in client software distribution and synchronization. Web browser enabled application will become an increasingly dominant method of delivering information, services and software (Tanenbaum, 2003).

- **Enterprise Servers** – Just a few years ago, conventional wisdom was that large systems would soon be extinct, to be replaced by networks of small computers. However, mainframe systems have rapidly evolved into enterprise servers with almost unlimited scalability combined with robust management tools, open protocol support, excellent security and high availability. While no single technology choice is the right solution for all needs, this trend will drive continued centralization of computing and data storage resources, and make the central provision of applications as services more attractive (Tanenbaum, 2003).
- **Organizational Dual Discipline Proficiency** – Increasingly, IT professionals need to have a solid understanding of the business and business professionals must be versed in the current technology issues and trends that affect their organization. IT has become an integral component of nearly all organizations, small and large. The accurate and timely information content of products and services is becoming a critical success factor in most organizations. This encourages organizations to recognize the importance of cross training IT and business leaders (Tanenbaum, 2003).
- **Convergence of Multi-Media Applications and Networks** – Innovations in technology are creating the opportunity to transmit voice, video and data over the same network. For example, video is becoming a common element of many applications. In Ethiopia the WoredaNet project, which is expected to be completed soon, is the result of this trend. Thus, this trend will continue to drive increasing

bandwidth requirements and shape both new applications and future networks (Tanenbaum, 2003).

- **Enterprise Portals** - Large, complex organizations, like state government are increasingly moving away from a multiple web site approach for providing services to a “web portal” strategy, which provides a single gateway to services across the organization. Web portals are essential web sites that provide various types of services in an integrated format. Often, users of a portal can create personal profiles that allow customized views of the information and services available. The use of portals at the enterprise level can benefit both service providers, and the customer, through the leverage of investment in IT resources, and having a single point of entry for all services provided by the enterprise (Tanenbaum, 2003).
- **Mobile Technology** - Mobile communication has also become the preferred mode of communication for not just the developed world but also in Africa. It is not just voice communication. Using your mobile phone you can receive and send fax, email, SMS, pictures or even video recordings. Mobile phones have become a comprehensive and instant communication tool. They have also become entertainment devices. They can have cameras, video recorders, FM radio, game console, music player and more. Mobile phones have become the communication and entertainment device of our time (Assefa, 2004).
- **Wireless Local Loop Telephone Technology** – This technology has eliminated the need of having a wired connection from the subscriber telephone to the end office of the fixed line telecom provider. Because of this fact, now fixed line telephones can easily be deployed in rural areas (Tanenbaum, 2003).

Any new Market Information System should be able to take advantage of the existing information and communication technology tools. The current trend of technology inclines towards web, mobile, telephony based solutions. However, the current trend in technology cannot be the only factor in selecting Market Information System for Ethiopia Commodity Exchange.

2.4.4. Institutional/Legal Analysis

Ethiopia has been implementing the federal government structure since the overthrow of the military government in 1991. The Federal Democratic Republic of Ethiopia (FDRE) comprises of Regional States. Regional States have been delimited on the basis of the settlement patterns, language, identity and consent of the people concerned. There are nine member regional states and two City Administration Councils of the FDRE. Regional State governments have three administrative hierarchies: Zonal, Woreda, and Kebele administrations (Government of FDRE, 1989).

Adequate powers have been given to the lowest units of government to enable the people to participate in the administration process. Woreda administration and Kebele administration are the lowest two administrative structures respectively. In rural Ethiopia the lowest administrative structure is called peasant association (Government of FDRE, 1989).

The Woreda is an administrative structure established within the Regional State. It comprises Kebele administrations or peasant associations. Woreda administration is delimited on the basis of the settlement patterns and geographical location. Duties and responsibilities of the Woreda are determined by the regional government constitution. It has got its own council whose members are elected by the residents. Kebele administration/Peasant Association is the

lowest administrative structure in the Regional State. Kebele administration is delimited on the basis of settlement patterns and geographical location, which make them easy for administration purposes. It is the main power center to run various activities at grass root level (Government of FDRE, 1989).

Duties and responsibilities of Kebele/Peasant association are determined by the regional government constitution. It has got its own council whose members are elected by the residents. It is believed that this level hierarchy enables the direct participation of people in the government administration (Government of FDRE, 1989).

The government of Ethiopia initiated WoredaNet project that is envisaged to connect all Woreda administration with high speed data connection. The WoredaNet project uses VSAT, through which over 600 Woredas administration centers will be interconnected for Voice, Data and Video transmission. Even though, the WoredaNet project has been in the implementation phase for a while, the project has not been completed successfully yet. Had the WoredaNet project been completed successfully, it would have been an excellent medium of market information dissemination tool for Ethiopia Commodity Exchange.

2.4.1. Countrywide Relevant Infrastructure Assessment

2.4.1.1. Telecommunication Infrastructure

One of the most important infrastructures that can affect the implementation of Market Information System is the country's Telecom Infrastructure. The introduction of Telecom Infrastructure dates back to 1894. In those early years, the new technological scheme contributed to the integration of the Ethiopian society when the extensive open-wire line

system was laid out linking the capital with all the important administrative cities of the country (ETC-2, 2004).

Recently, the Telecommunications sector was restructured and the Council of Ministers Regulation Number 10/96 established two separate independent entities, namely the Ethiopian Telecommunications Agency (ETA) and the Ethiopian Telecommunications Corporation (ETC) in 1996 (ETC-5, 2004).

ETC was setup as an operator and restructured to engage in the expansion and improvement of telecom services, in revitalizing telecom infrastructure development works and in operations of independent telecommunication corporate business under a leadership of a board of directors with an autonomous status. ETC has now been given the independence to invest its profit on the development of telecommunications network (ETC-2, 2004).

ETC has introduced several telecom services in the past two decades. It started to give Internet service in 1989 (E.C). Then started to give mobile telephone service in 1991 (E.C). ETC has also implemented several wide area network connectivity technologies enabling, government ministries, banks, insurance companies, NGOs, and private firms to interconnect their offices across Ethiopia. ETC provides several connection options for wide area network connectivity. Each technology is discussed below (ETC-2, 2004).

- Dial up and Leased Line - The main difference between dial-up and leased line is that the later is dedicated connection while the former is a connection which is established when needed. In the case of dial-up connection, when data is available, dial-up connection is established and the data will be transferred via the telephone connection. Due to the fact that dial-up lines use analog connection, the line is highly susceptible

to noise which reduces its quality. Theoretically, both leased and dial-up lines can support data rates up to 64kbps. However, in reality this does not happen. One of speed limitations is maximum data rate supported by modems which is 56kbps. Usually dial-up connection speeds are less than 50 kbps. Currently, ETC has stopped giving leased line service (ETC-3, 2004).

- Integrated Services Digital Network (ISDN) - ISDN is a switched digital service. Using this technology ETC can deliver data rates up to 128 kbps. Even though ETC has all the facilities and equipment to give this service, currently, the service has been discontinued (ETC-4, 2004).
- Digital Data Network (DDN) - Digital Data Network (DDN) is a service given by ETC for digital wide area network connectivity. The technology makes it possible to share data across cities. DDN is a private leased line service that offers a wide range of secure, high-speed, and reliable transmission. Currently the ETC is moving towards a new digital network solution – *Broadband Multimedia* (ETC-1, 2004).
- Broadband Multimedia - Broadband Multimedia is the newest service provided by ETC. Broadband Multimedia provides digital connection between points using the latest networking technologies. Broadband multimedia allows voice, video and data transmission over the same physical line. In addition, at places where telephone lines are not installed ETC gives wireless broadband connection services. ETC at this point can provide broadband multimedia connection with speeds up to (Chellis, 1998).

2.4.1.2. Electricity Infrastructure

The power sector plays an important role in any effort of automation. The success of any type of Market Information System also depends heavily on the availability of electricity infrastructure at national level. In this sub-section we shall assess the current status of power

generation and transmission status of the country The Ethiopian Electric Power Corporation (EEPCo) is the company responsible for power generation, transmission, and distribution and sales of electricity all over the nation (EEPCo, 2007).

Currently, the annual electricity production capacity of the corporation is about 3112GWH and the number of customer is about 1.1 million. Every year EEPCo is increasing its customers by 15%. However, the demand for electric power of the country has not been met so far. EEPCo has developed a strategy to expand the existing distribution network coverage on the already electrified towns and villages and build new lines through rural electrification. More than 6000 towns and villages will be connected for the next five year. *Table 1* shows strategic plan of the universal Electricity Access Program (EEPCo, 2007).

Table 1 - Towns and Villages that will be Electrified in the Next Five Years

Political Region	2005/06	2006/07	2007/08	2008/09	2010/11	Total
Tigray	13	64	128	128	115	448
Afar	3	15	30	30	26	104
Amhara	50	251	501	501	452	1753
Oromya	65	323	545	545	582	2263
Somali	6	29	59	59	52	204
Benishangul	3	18	34	34	30	119
Gambella	1	15	33	33	30	115
Harari	34	2	3	3	3	13
Southern Peoples	1	137	275	275	248	963
Diredawa	1	2	5	5	5	18
Total	179	857	1714	1714	1543	6007

Source: The Ethiopian Electric Power Corporation

2.5. Experience of the Kenya Agricultural Commodity Exchange

The Kenya Agricultural Commodity Exchange (KACE) was set up in 1994 to provide the basic services of a commodity exchange. The products meant to be traded were agricultural commodities like cereals, dairy products and cotton. However, the exchange was not able to materialize its primary goal which is commodity trading. Instead, focus has shifted towards information dissemination. KACE initiated the idea of agricultural Market Information System. Initially, KACE was funding the project from its own capital. However, later on, the initiative has attracted funding support through various projects from a number of development partners and aid donors (KACE, 2005).

KACE collects, processes, updates and disseminates market information daily to farmers and other market intermediaries through its Market Information System. Market information includes prices of commodities in different markets, and commodity offers to sell and bids to buy. Through the offers and bids function, farmers are able to get market information. KACE monitors the usage of the Market Information System, and receives feedback which it uses to continuously refine and improve the system (KACE, 2005).

The main challenges facing the Market Information System of KACE are:

- how to ensure widespread use of the Market Information System that it has developed.
- the unreliable mobile phone network availability in remote rural areas where a majority of smallholder farmers live, which limits access to the SMS and IVR services.

One of the keys to development in Africa is to link markets and technologies, with markets providing farmers with better incentives to use technologies. The KACE Market Information System consists of various components designed to link the farmer to market outlets at

different levels of commodity value chains, from other farmers to traders, commodity dealers, processors and even exporters and importers. In the following sub sections the different types of Market Information Systems implemented by KACE will be briefly discussed (KACE, 2005).

2.5.1. Market Information Points (MIP)

A MIP is an information kiosk located at a rural market centre where farmers go to sell and traders to buy agricultural products. A MIP serves as a source of marketing information and intelligence, and also as a trading floor to link buyers and sellers of commodities in a transparent and competitive manner. Information is prominently displayed on bulletin and writing boards at a MIP. MIPs are operated by KACE staff. Where a MIP has a direct or internet link with the KACE Headquarters, market information is sent direct to the MIP. Information is available at a MIP every market day. Users visit MIPs to view and use the information for free (KACE, 2005).

2.5.2. Market Information Centers (MIC)

A MIC is established to manage and service a number of MIPs which are located in rural market centers which do not have electrical power supply and/or fixed landline telephone service to enable internet connectivity. It is equipped with facilities of Information and Communication Technologies such as landline and mobile phones, fax and computer with email and internet connectivity. KACE headquarters in Nairobi sends market information to a MIC. The MIC downloads the information and prints hard copies which it distributes to MIPs (KACE, 2005).

2.5.3. The Mobile Phone SMS

SMS is text messages sent and received with mobile phones. KACE is harnessing this technology to disseminate market information and intelligence. KACE has developed an SMS market information service in partnership with a local mobile phone service provider. A farmer anywhere in the country, where the mobile phone network exists, can in easy steps access market information like commodity prices in different markets. The user receives and pays for the SMS messages to the telecom operator. SMS is easy to use, reliable, convenient and low-cost. The information is updated every day and hence is most current and timely to the user (KACE, 2005).

2.5.4. Interactive Voice Response System

In responding to the different client needs KACE has, in collaboration with an IVR service provider, also developed where users call a telephone number to access market information in voice mail. Any mobile phone or digital landline can be used to call the IVR system. This service is available in both English and Kiswahili and a caller follows an easy step-by-step pre-recorded voice prompt menu to choose the language and access the information. Like the SMS service the IVR Hotline service is low-cost, timely and convenient to use (KACE, 2005).

2.5.5. Email Based Market Information System

KACE has developed an email based Market Information System for dissemination of market information. The system is an electronic database of clients interested in buying, selling, importing, exporting or distributing agricultural commodities. KACE collects and disseminates marketing information on commodity offers, bids and prices through the email mailing list as frequently as it compiles the data, sometimes several times a day. There are

currently about 550 client recipients in the database, spread in about 26 countries around the world, the majority being in eastern Africa (KACE, 2005).

2.5.6. The Website

The KACE website, *www.kacekenya.com* serves as a virtual library of market information and also as a virtual trading floor for commodities. Through the website, KACE clients are linked into Kenyan, regional (Eastern Africa) and international markets, facilitating them to transact export and import trade most efficiently. KACE uses its website to disseminate vital market information to the public (KACE, 2005).

2.5.7. Mass Media

KACE in conjunction with the Kenya Broadcasting Corporation (KBC) radio, Kenya's national radio service disseminates price information on a limited number of commodities in selected markets daily except Sundays. The information is aired both in English and Kiswahili languages. According to KBC estimates about 5 million people listen to the radio program weekly. KACE updates the information on a daily basis. The KBC radio network covers the whole country even in remote areas, and is therefore widely listened to by the public, including smallholder rural farmers (KACE, 2005).

2.6. Experiences Commodity Exchanges of India, Nigeria, and South Africa

2.6.1. The Multi Commodity Exchange of India

Multi Commodity Exchange of India Limited (MCX) is an exchange with permanent recognition from the Government of India for setting up a nationwide, online (electronic) multi commodity marketplace. Promoted by Financial Technologies Limited, MCX has

introduced a state-of-the-art, online digital exchange for commodities trading in the country. Market information system implemented by MCX is fully web based (MCX- Training Department, 2006).

2.6.2. The Abuja Securities and Commodity Exchange

Nigeria is an agrarian society having over 70% of its estimated population engaged in agricultural sector. However, Nigerian agricultural sector is characterized by low output, low access to financing, poor quality of agricultural products and lack of efficient market. In order to address these problems government intervened through the establishment of Abuja Securities and Commodity Exchange. ASCE was originally incorporated in 1998 as a stock exchange. Later it was converted to a commodity exchange by the federal government of Nigeria. ASCE mainly uses email based and website based Market Information System to disseminate price information to the public (Nigeriabusinessinfo.com, 2001).

2.6.3. Agricultural Commodity Derivatives Market of South Africa

The agricultural commodity derivatives market in South Africa was established in 1995 as a separate division of the South African Future Exchange. The primary reason for the establishment of the market was the emergence or recognition of agricultural price risk within the sector. Around 20% of commercial farmers are actively involved in the market. Indeed, the price discovery role of the exchange is such that the price is used throughout South Africa as reference price. The main market information dissemination tool used is the Internet utilizing email services and website (SAFEX, 2005).

2.7. Ethiopia Commodity Exchange's Preliminary Plan

The application of ICT is taking the market to the door-step or farm-gate of the farmer. When Ethiopia Commodity Exchange become fully operational it will lower transaction costs and improves market efficiency, and thereby enhance smallholder farmer access to markets and lower market risks.

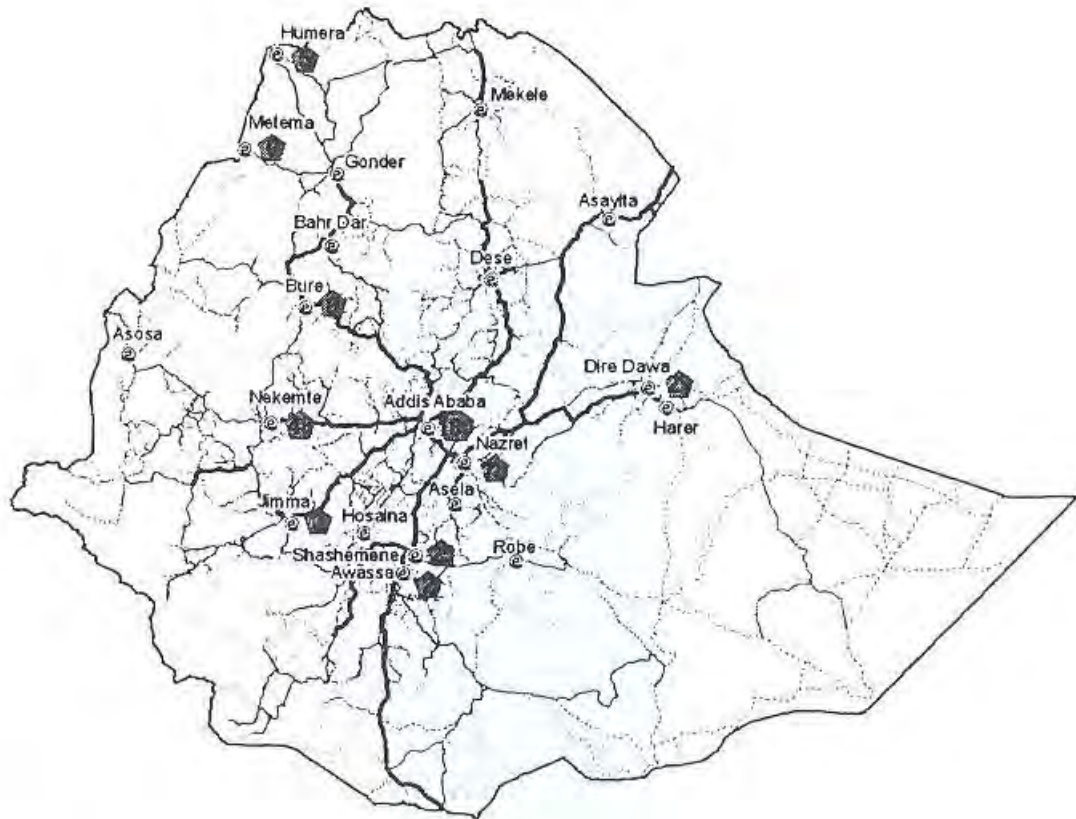
Selection, design and implementation of a Market Information System are among the important tasks that are currently being undertaken by the Ethiopia Commodity Exchange. The Ethiopia Commodity Exchange has plans to distribute market information, at Woreda level, through its 200 rural site across Ethiopia. The exchange plans to transmit real time price information to these 200 sites directly from the trading floor in Addis Ababa. Prices of other markets (off exchange) will also be distributed to the public. Price information of agricultural products will be displayed on Plasma Display Screens which will be installed near rural market places.

Initially, Ethiopia Commodity Exchange was planning to use WoredaNet infrastructure to connect Ethiopia Commodity Exchange's head office in Addis Ababa with the 200 remote sites. However, after Ethiopia Commodity Exchange did an assessment on WoredaNet infrastructure they have found that using the WoredaNet may not be reliable. Currently, Ethiopia Commodity Exchange is exploring the option of using VSAT to connect the trading floor with the 200 remote plasma display installations.

In addition to the 200 remote plasma display sites, Ethiopia Commodity Exchange is also planning to have 20 remote electronic trading centers in different parts of the country (See *Figure 4*), namely, Addis Ababa, Bure, Metema, Humera, Nazareth, Awassa, Dire Dawa,

Jimma, Nekemte, Shashemene, Bahir Dar, Gondar, Mekele, Dessie, Hosaina, Bale Robe, Harar, Assela, Asayita, Arba Minch, and Asosa. These centers will be equipped with computers and high speed Internet connection. Via the Internet farmers/traders can get access to live market information. In fact, through the electronic trading centers, users will be allowed to place orders to their brokers as well.

Figure 4 - Ethiopia Commodity Exchange Electronic Trading Sites



Source: Ethiopia Commodity Exchange

CHAPTER 3 - Problem Analysis

To make a living, the rural community of Ethiopia is mainly dependent upon agricultural products. Their lives are directly attached with farming. Farmers produce agricultural products to satisfy their basic needs. Usually, farmers sell their product to merchants from the city.

Farmers in the rural areas do not have access to market information. The main source of information they have is the merchants who come to buy their agricultural products. However, there is a conflict of interest problem with this scenario. For their own benefit, merchants do not give the farmers correct market information. Due to lack of market information, farmers are forced to sell what they produce at very low prices. This has a direct impact on the economic development of the rural areas hence that of the country.

Ethiopia Commodity Exchange is established to alleviate the above stated problem. However, the problem can only be solved if Ethiopia Commodity Exchange implements the right type of Market Information System. Ethiopia Commodity Exchange's Market Information System can play an important role in promoting increased trade within Ethiopia and East Africa. Establishing sustainable Market Information System that serves all stakeholders is important. This means that Market Information System interventions must go beyond the important technical details of collection methodology and database management to consider the responsiveness of the system to users' needs.

3.1. Observed Problems of Market Information Delivery

While conducting system requirement study, several problems have been identified. The following are some of observed problems of market information delivery.

3.1.1. Accurate and Specific Market Information Delivery

One mechanism of getting market information is by asking people who come from the cities. Information is transferred from one farmer to the other through word of the mouth. Usually, market information provided in this manner is not accurate and highly susceptible to error. The other problem is that up to date information cannot be obtained through this technique. Generally, people who come from the cities do not have fresh market information. Hence, what farmers get is usually out dated and inaccurate market information.

Often, farmers want to know price of specific agricultural product having specific quality. Radio and Television broadcasts cannot provide specific market information. Usually, the information broadcasted is too general and cannot provide specific information needed by farmers. In fact, it is not technically and financially viable to broadcast the price list of agricultural products at every market in the country every hour. Using Radio and Television technology one can only give price indication of major agricultural product at major market places of Ethiopia. Hence, specific and accurate mechanism of information delivery is required to effectively serve the agricultural product producers of Ethiopia.

3.1.2. Information On Demand

The other issue that can be raised is the timing of information delivery. When do we give farmers market information? The answer is straight forward and simple – *When they want it!* Farmers must to get market information only when they want it. The Ethiopian Radio and

Television broadcast market information, however, the broadcast time and date is usually not convenient for farmers and it is not when they want the information. Furthermore, the farmers may miss the broadcast time. Radio and TV broadcast is simply too inconvenient and inefficient way of providing market information, in spite of their wider reach capacities.

3.1.3. Technical Skill and Language

Farmers and cooperative societies are the main users of this market information delivery system. Most of Ethiopian farmers are not educated enough to use computers. Hence, for a proposed market information delivery solution to be feasible, it should not require too much technical skill. Radio and television broadcasts do not require technical skill from the farmers' side. In fact, anyone who knows how to turn on and tune a radio and television can get market information. On the other hand, using computers to get market information may require technical skill which farmers of Ethiopia do not have.

The other problem is the language issue. Most farmers in the rural parts of Ethiopia only speak and understand one language – their local language. Market information should be delivered to farmers in their own local language.

3.1.4. Lack of Skilled ICT Manpower

Implementation of ICT based Market Information Systems like the website based solution requires trained manpower and computer literate end users. Ethiopia Commodity Exchange may need train and dispatch its staff members all over Ethiopia to support its Market Information System.

3.1.5. Lack of Proper infrastructure

The rural parts of Ethiopia are mainly characterized by poor availability of telecom and electricity infrastructure. Due to this fact, implementing computer based systems in the villages of rural Ethiopia is very difficult.

Table 2 - Telephone Service Subscription by Region (July 2007)

Region	Fixed Line	Mobile	Wireless
Addis Ababa	451512	876320	34432
North Eastern Region	46430	20748	4
North Western Region	72216	960	38
Western Region	38246	10907	505
Eastern Region	75786	20949	720
Southern Region	101070	3835	135
South Western Region	53149	717	1889
South Eastern Region	117919	1791	8
Total	956328	936227	37731

Source: Ethiopian Telecommunication Corporation

The *Table 2* shows total number of subscription of telephone service in Ethiopia. The majority of telephone subscription is concentrated in Addis Ababa. Out of the total fixed line telephone subscription 47.21% is from Addis Ababa; 93.6% of mobile telephone and 91.26% Wireless telephone subscription are from Addis Ababa. Furthermore, total of 568, 022 telephone subscriptions (fixed line, mobile and wireless combined) are from outside of Addis Ababa.

3.2. Cause and Effect Analysis

The intrinsic nature of problems against their respective causes and effects are shown on the consecutive pages using Ishikawa model. This model helps to explore and show the main problems in line with all exhaustive causes that contribute for the existence of the problem and the side effect that imposes on the general environment.

Figure 5 - Information Time Lag caused by Traditional Market Information Systems

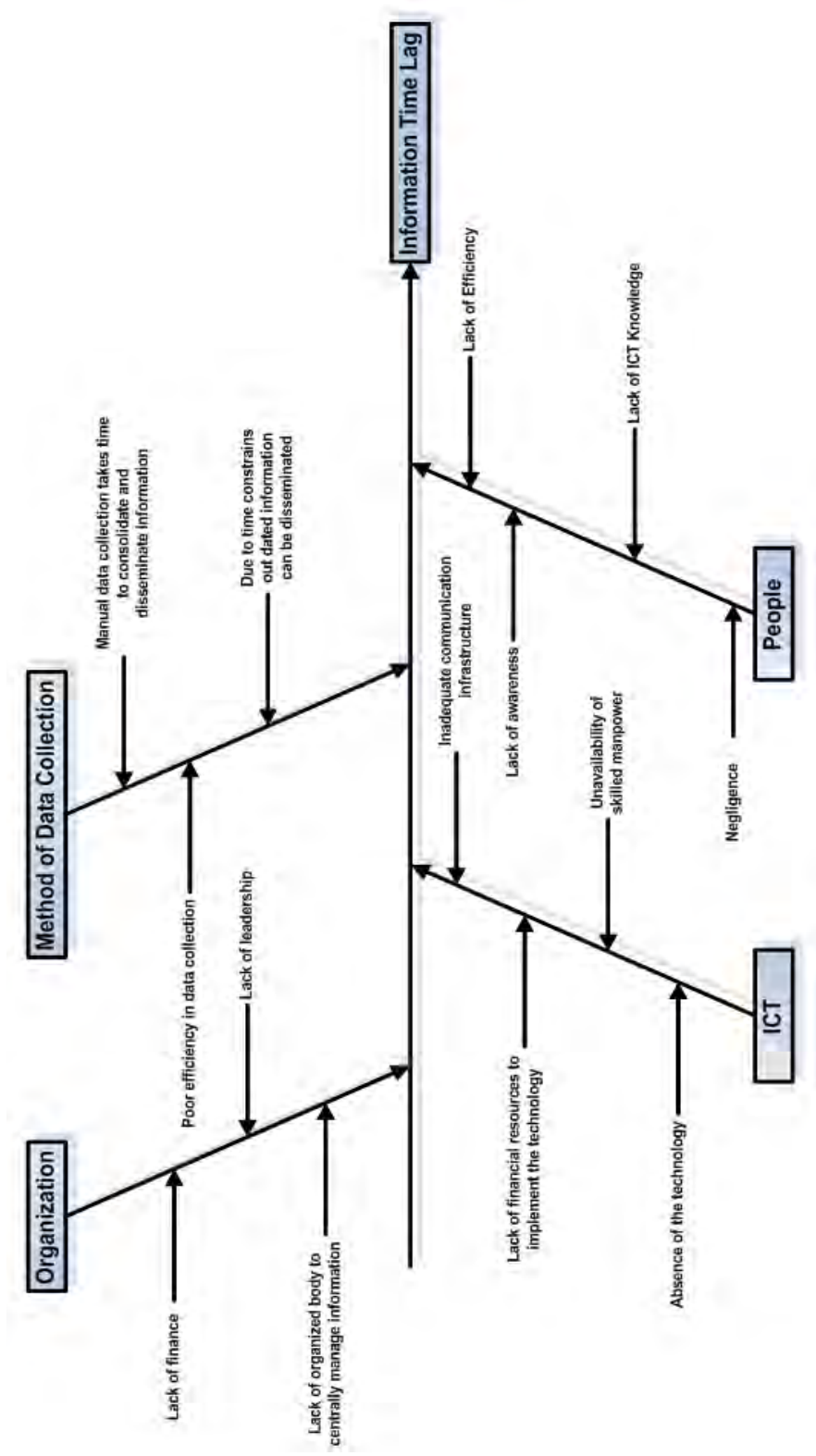


Figure 6 - Inaccurate Information Delivery caused by Traditional Market Information Systems

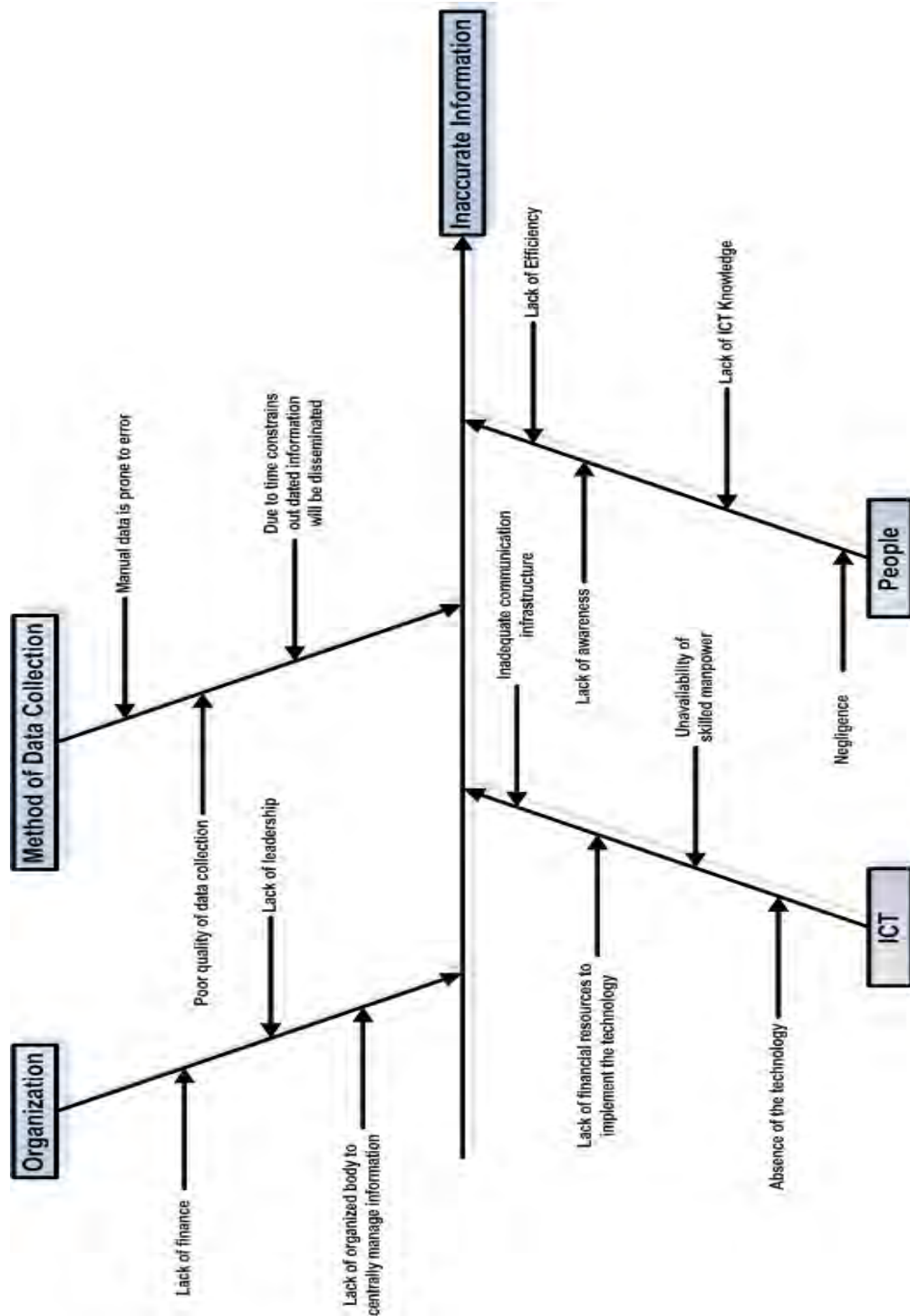


Figure 7 - Low Implementation Cost of the Proposed Market Information Systems

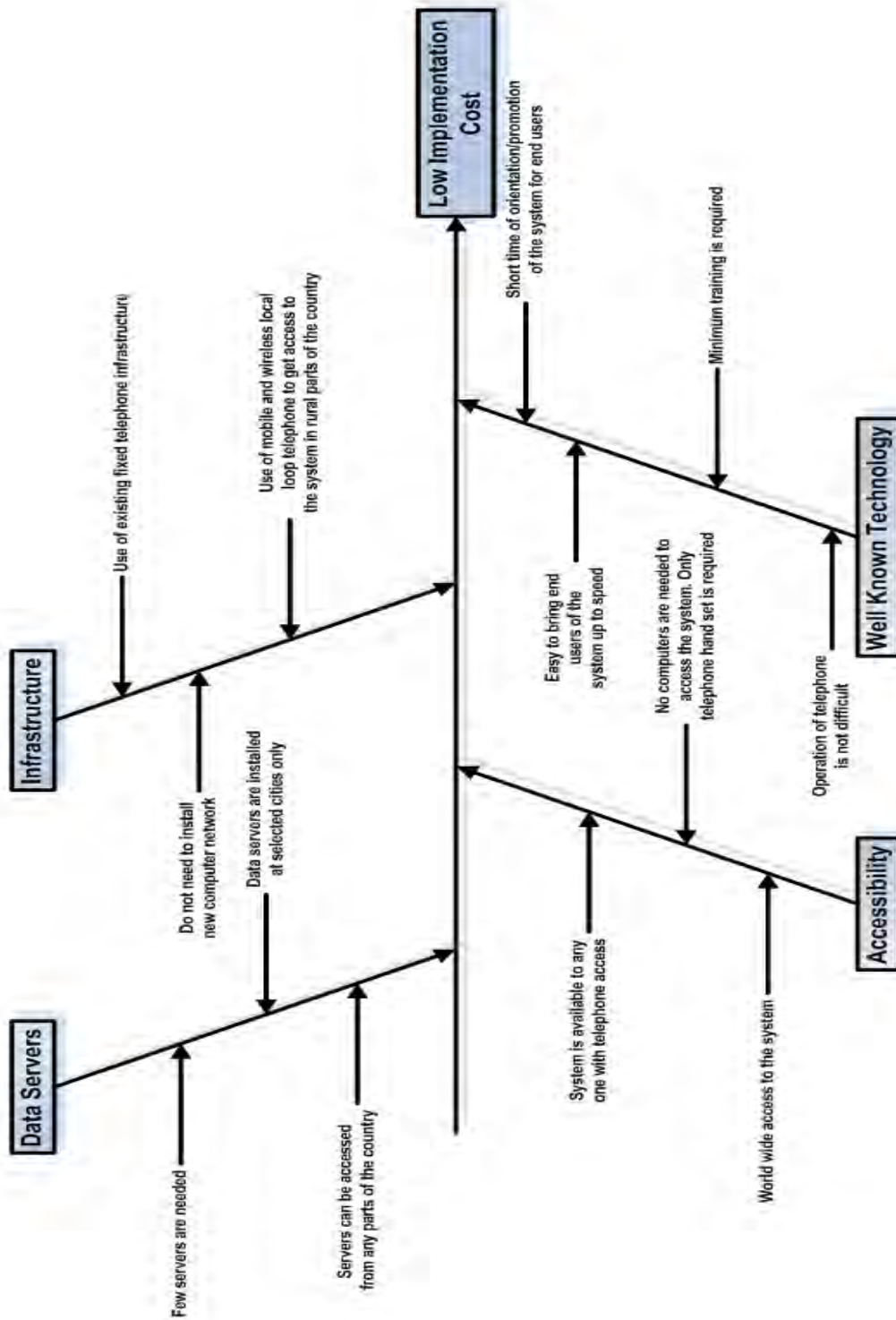
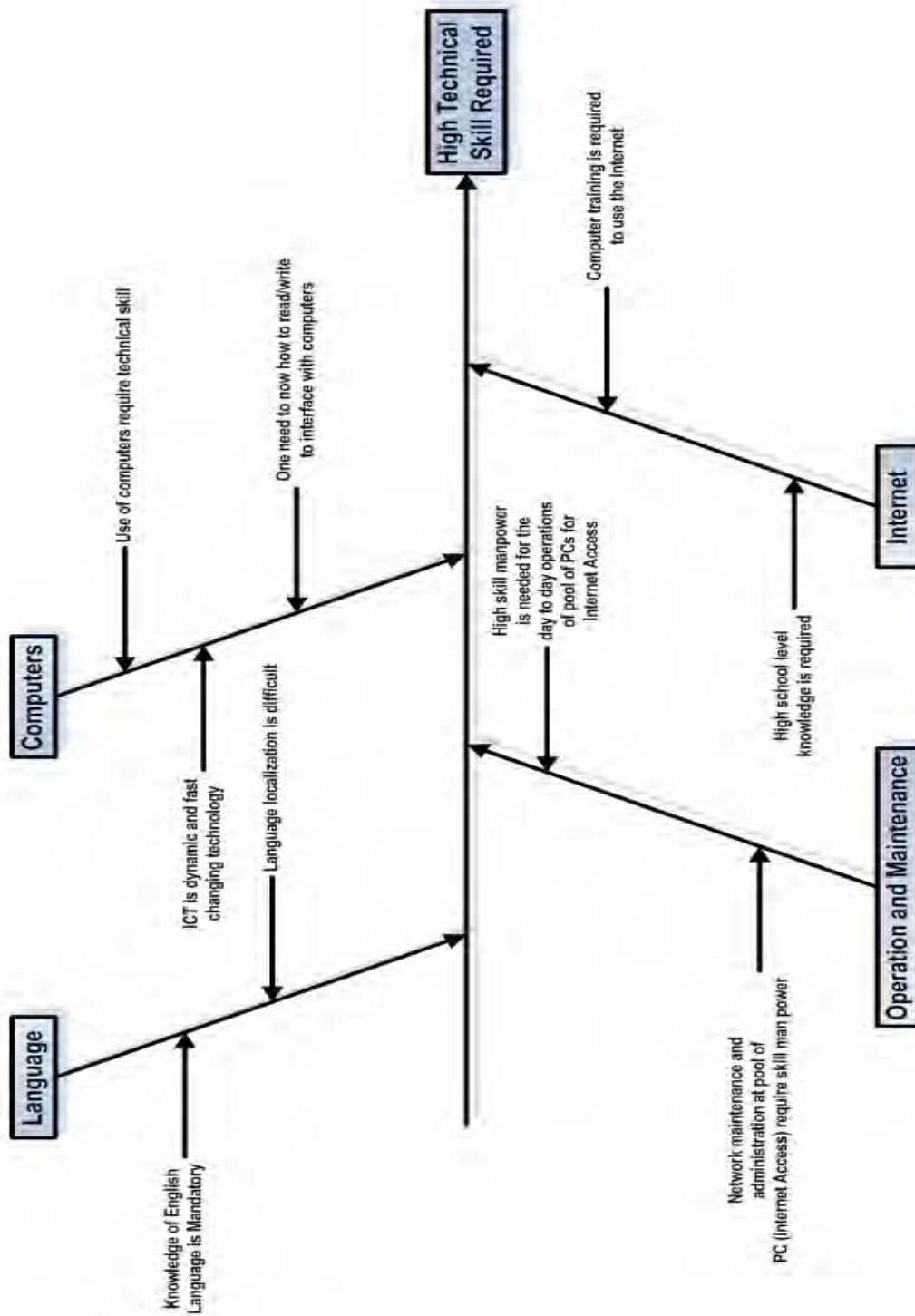


Figure 8 - High Skill Requirements of Web based Market Information System



3.3. Market Information Requirements of Ethiopia Commodity Exchange

One of the objectives of establishing commodity exchange in Ethiopia is to facilitate trade between farmers and distributors/consumers. The Ethiopia Commodity Exchange is believed to reduce cost of agricultural product by enabling farmers to directly sell their produce to the main distributors in the city. This will also help boost the income of farmers because it will eliminate many of the middle men.

Farmers sell their product directly to the exchange through some designated broker. To make farmers participate in the buying and selling process there should be some kind of system in place that can provide price information to the public.

Ethiopia Commodity Exchange has two types of Market Information System need, namely:

- Real Time Price Information
- Closing Price and Volume Information

3.3.1. Real time Price Information

Real time price information is what is commonly called price ticker. This kind of price information is disseminated when trading is in session. When trading is active, prices of commodities fluctuate with time. Farmers in the rural areas should be able to get this price information as prices change so that they can instruct their broker as to when to sell their produce. Whenever a deal happen, that is when a seller and buyer agree on a price that will be the current price of the commodity being traded. The current trading price therefore should be immediately distributed via the Market Information System machinery of Ethiopia Commodity Exchange to places all across Ethiopia.

3.3.2. Closing Price and Volume Information

Closing price is the price at which the last transaction of a particular commodity was concluded in the commodity exchange. Closing price information is also required to be distributed by the exchange at the end of each trading day. In addition to the closing price, volume information is also required to be disseminated to stakeholders. Volume refers to the total volume of commodities traded on a particular day. The volume information helps farmers and traders to assess the strength or weakness of the market movement. An increased volume shows the strength of the movement, while the decline shows a weakening movement.

3.4. Market Information System Types Identified

After doing a thorough survey of Market Information System implementations of other commodity exchanges, in the system investigation process the following traditional and modern Market Information System alternatives have been identified:

- Mass Media (Radio and Newspaper) Based System
- Mobile Phone Short Messaging Service (SMS)
- Interactive Voice Response (IVR) Based System
- Email Based System
- Plasma Display Based System
- Market Information Points (MIPs)
- Telephone Based Query System
- Website Base Market Information System
- Word of Mouth Based System

A system requirement analysis was conducted using questionnaire and interview and the following requirements are chalked out for Ethiopia Commodity Exchange:

- The new solution should be cost effective. Implementation and operational cost of the system should be minimal.
- Implementing computer network infrastructure across the country is expensive. Hence, the cheaper, widely available and expanding mobile/Wireless/fixed telephone infrastructure should be used as a medium of communication.
- The networking technology used for wide area connectivity should be a reliable technology and at the same time an affordable one.
- Using the new Market Information System, market information should be delivered to the regions in the local language of the area.
- The new Market Information System should be easy to use and should not require high technical skills.
- The system should have a wide area of coverage. In fact, farmers from rural parts of Ethiopia should be able to access the system.
- The system should be accessible all the time (24/7).
- The system should provide farmers with specific and accurate market information
- Farmers, traders, and all market participants should be able to get market information when they want it.

Based on the system requirement stated above, the following evaluation criteria were developed. During the system study process, all of the criteria identified were found to be equally important to Ethiopia Commodity Exchange. Hence, all of them are given equal weight:

- Criterion 1: Accessibility
- Criterion 2: Availability (24/7)
- Criterion 3: Ease of use
- Criterion 4: Implementation and operational cost
- Criterion 5: Information on demand
- Criterion 6: Localization for rural areas
- Criterion 7: Minimum technical skill required
- Criterion 8: Real-time information delivery

3.4.1. Alternative 1: Mass Media (Radio/Newspaper) Based System

Limited market price information can be disseminated using mass media based Market Information System. One of the strength of this technique is that it has wide area of coverage. Access to the mass media has its own cost. For radio broadcast an air time fee is charged. There is also some kind of charge which is asked to publish material on newspapers as well.

Even though, the mass media has wide area of coverage real time information cannot be distributed through it. In addition, one can get market information only at specific times. For instance, for the radio broadcast one has to know the time where the radio station broadcast market information. Therefore, mass media is not just the right tool of distributing market information for Ethiopia Commodity Exchange.

Table 3 - Evaluation of Mass Media (Radio and Newspaper) Based System

Criteria	Bad=0	Good=2	V. Good=3	Excellent=4
Accessibility			X	
Accuracy of Information		X		
Availability (24/7)	X			
Ease of Use		X		
Implementation/Operational Cost				X
Information on Demand	X			
Localization for Rural Areas		X		
Minimum Technical Skill				X
Real-Time Information Delivery	X			
Total Points			17	

3.4.2. Alternative 2: Mobile Phone Short Messaging Service (SMS)

In many countries, Short Messaging Service (SMS) has become a popular way of communication. Market information system based on SMS has been successfully implemented in Kenya and has proven to be easy to use and cost efficient. Using SMS technology one can deliver real time market information to end users. Information can also be delivered in the local language of the recipient. SMS based Market Information System can be made available all the time, that is, twenty four hour a day and seven days a week.

In the Ethiopian context, SMS based Market Information System might have been one of the best alternatives available given the Market Information System requirements of Ethiopia Commodity Exchange. However, unfortunately, the SMS service of Ethiopian Telecommunication Corporation has been discontinued. Due to this reason this alternative cannot be considered as Market Information System solution in Ethiopia until Ethiopian Telecommunication Corporation reactivate the service again.

Table 4 - Evaluation of Mobile Phone Short Messaging Service (SMS)

Criteria	Bad=0	Good=2	V. Good=3	Excellent=4
Accessibility				X
Accuracy of Information				X
Availability (24/7)				X
Ease of Use			X	
Implementation/Operational Cost				X
Information on Demand				X
Localization for Rural Areas				X
Minimum Technical Skill			X	
Real-Time Information Delivery				X
Total Points			34	

3.4.3. Alternative 3: Interactive Voice Response (IVR) Based System

IVR based Market Information Systems provide interactive media service. One of the greatest strength of this solution is the fact that it is accessible for anyone who has a connection to a normal telephone network. There is no need of having a computer or Internet connection. Up to date and live market information can be received using IVR based systems. Implementation and operational costs are also reasonable.

Market information is provided for end users in their own local languages as well. In addition, IVR based systems can provide market information whenever end users want it. The system is available twenty four hours a day and seven days a week. Anyone who knows how to make telephone calls can use the system. The system interacts with end users via pre recorded voice messages making it user friendly for people who do not know how to read and write.

Table 5 - Evaluation of Interactive Voice Response (IVR) Based System

Criteria	Bad=0	Good=2	V. Good=3	Excellent=4
Accessibility				X
Accuracy of Information				X
Availability (24/7)				X
Ease of Use				X
Implementation/Operational Cost			X	
Information on Demand				X
Localization for Rural Areas				X
Minimum Technical Skill			X	
Real-Time Information Delivery				X
Total Points			34	

3.4.4. Alternative 4: Email Based System

In today's complex business environment, email has become the cornerstone communication tool. With email users send and receive plain or formatted text messages, fully formatted reports, spreadsheets, databases, sounds, video, etc. The email based system tries to take advantage of the popularity and availability of email systems.

One of the drawbacks of this solution is that real time information cannot be relayed to end users. Users get market information at a specific interval via email. In addition, the email based system is not available twenty four hour a day seven days a week. It is also technically possible to accommodate more than one languages to provide localized solution. However, for this solution to work, end users should have access to the Internet and the knowhow on how to retrieve and read email messages. Hence, some level of technical skill is required. One of the strong aspects of this solution is that implementation and operational cost is minimal.

Table 6 - Evaluation of Email Based System

Criteria	Bad=0	Good=2	V. Good=3	Excellent=4
Accessibility			X	
Accuracy of Information			X	
Availability (24/7)		X		
Ease of Use			X	
Implementation/Operational Cost				X
Information on Demand		X		
Localization for Rural Areas			X	
Minimum Technical Skill		X		
Real-Time Information Delivery	X			
Total Points			22	

3.4.5. Alternative 5: Plasma Display Based System

The plasma display system can be a good market information tool. Ethiopia Commodity Exchange have chosen to implement plasma display based solution when the exchange becomes operational. One of the drawbacks of this solution is its high cost of implementation and operation. Installing plasma display screen in rural area and near market places can be very expensive. In addition, Ethiopia Commodity Exchange needs to have a high speed data connection from each plasma display screen to the head office in Addis Ababa.

It is also a bit of a hassle for farmers to go to the nearby market place to get market information. In addition, the accessibility of the system is limited to the number of plasma display installation site. Furthermore the Plasma based system is not available twenty four hour a day seven days a week.

Table 7 - Evaluation of Plasma Display Based System

Criteria	Bad=0	Good=2	V. Good=3	Excellent=4
Accessibility			X	
Accuracy of Information				X
Availability (24/7)			X	
Ease of Use			X	
Implementation/Operational Cost		X		
Information on Demand		X		
Localization for Rural Areas			X	
Minimum Technical Skill			X	
Real-Time Information Delivery			X	
Total Points			26	

3.4.6. Alternative 6: Market Information Points (MIPs)

Users visit MIPs to receive market information. They read the information placed on the MIP wall or on boards. Users who cannot read get assistance from the MIP staff. Obviously, accessibility of the system is limited. The system is also only available during office hours and farmer may not be able to get market information when needed.

One of the great aspects of this type of solution is the fact that market information can be delivered in the local language of the region. No technical skill is required to use this type of Market Information System solution.

Table 8 - Evaluation of Market Information Points (MIPs)

Criteria	Bad=0	Good=2	V. Good=3	Excellent=4
Accessibility			X	
Accuracy of Information			X	
Availability (24/7)			X	
Ease of Use			X	
Implementation/Operational Cost			X	
Information on Demand		X		
Localization for Rural Areas			X	
Minimum Technical Skill			X	
Real-Time Information Delivery	X			
Total Points			23	

3.4.7. Alternative 7: Telephone Based Query System

Calling relatives, friends, or somebody close to a market to get market information is probably the most popular market information gathering technique currently in use. Obviously, implementation and operational cost of this type of solution is minimal. However, information gathered through this technique may not be accurate and timely. In addition, one cannot get the information on a specific agricultural product when needed.

Using this type of Market Information System solution one may not be able to get market information twenty four hour a day seven days a week. Furthermore, real time information delivery is not possible.

Table 9 - Evaluation of Telephone Based Query System

Criteria	Bad=0	Good=2	V. Good=3	Excellent=4
Accessibility		X		
Accuracy of Information	X			
Availability (24/7)	X			
Ease of Use		X		
Implementation/Operational Cost				X
Information on Demand	X			
Localization for Rural Areas	X			
Minimum Technical Skill				X
Real-Time Information Delivery	X			
Total Points			12	

3.4.8. Alternative 8: Website Based Market Information System

Website based Market Information System is uses cutting edge technology to deliver market information. However, implementing cutting edge technology may not be enough to solve the Market Information System requirements of Ethiopia Commodity Exchange. The rural parts of Ethiopia are characterized by lack of education and telecommunication infrastructure. Implementing this solution would require installing computers and computer networks at villages of rural Ethiopia. WoredaNet, a networking project started to connect all weredas in Ethiopia, would have been an excellent medium to distribute market information, however, the project have not been completed successfully yet. As indicated above, website based solution has high operational and implementation cost. In addition it requires trained end users to interface with the system. To use the system, one has to have basic knowledge of computes. One of the strength of this solution is the fact that it can deliver market information is localized manner. The system has also high accessibility and availability. Using this type of Market Information System, one can deliver accurate and live market information to farmer and traders in remote parts of Ethiopia.

Table 10 - Evaluation of Website Based Market Information System

Criteria	Bad=0	Good=2	V. Good=3	Excellent=4
Accessibility			X	
Accuracy of Information				X
Availability				X
Ease of Use		X		
Implementation/Operational Cost		X		
Information on Demand				X
Localization for Rural Areas				X
Minimum Technical Skill	X			
Real-Time Information Delivery				X
Total Points			27	

3.4.9. Alternative 9: Word of Mouth Based System

This alternative is the most inefficient way of getting market information. People get information from their neighbor or from people who recently visited market places. This kind of market information is usually free but one may not get the market information when needed. Therefore, there will be some opportunity cost associated with it. Looking for a people who visited market places has its own cost as well. On the upside, people get the market information in their own local language. Market information received in this manner is highly prone to errors. Furthermore, the market information will most likely be out dated. One of the advantages of this alternative is that no technical skill is required in the market information gathering process.

Table 11 - Evaluation of Word of Mouth Based System

Criteria	Bad=0	Good=2	V. Good=3	Excellent=4
Accessibility	X			
Accuracy of Information	X			
Availability	X			
Ease of Use	X			
Implementation/Operational Cost				X
Information on Demand	X			
Localization for Rural Areas				X
Minimum Technical Skill				X
Real-Time Information Delivery	X			
Total Points			12	

3.4.10. Summary of Evaluation Results

Table 12 - Summary of Evaluation Results

Market Information System Types	Score
Mass Media (Radio and Newspaper) Based System	17
Mobile Phone Short Messaging Service (SMS)	34
Interactive Voice Response (IVR) Service	34
Email Based System	22
Plasma Display Based System	26
Market Information Points (MIPs)	23
Telephone Based Query System	12
Website Based Market Information System	27
Word of Mouth Based System	12

With SMS based solution out of the contest, as shown on the table above IVR based Market Information System has scored the highest points. With less knowledge and computer equipment, IVR based Market Information System allows anyone who has access to the telephone to get market information via the telephone. High level system design of IVR based Market Information System is presented in the next chapter.

CHAPTER 4 - Proposed System Design

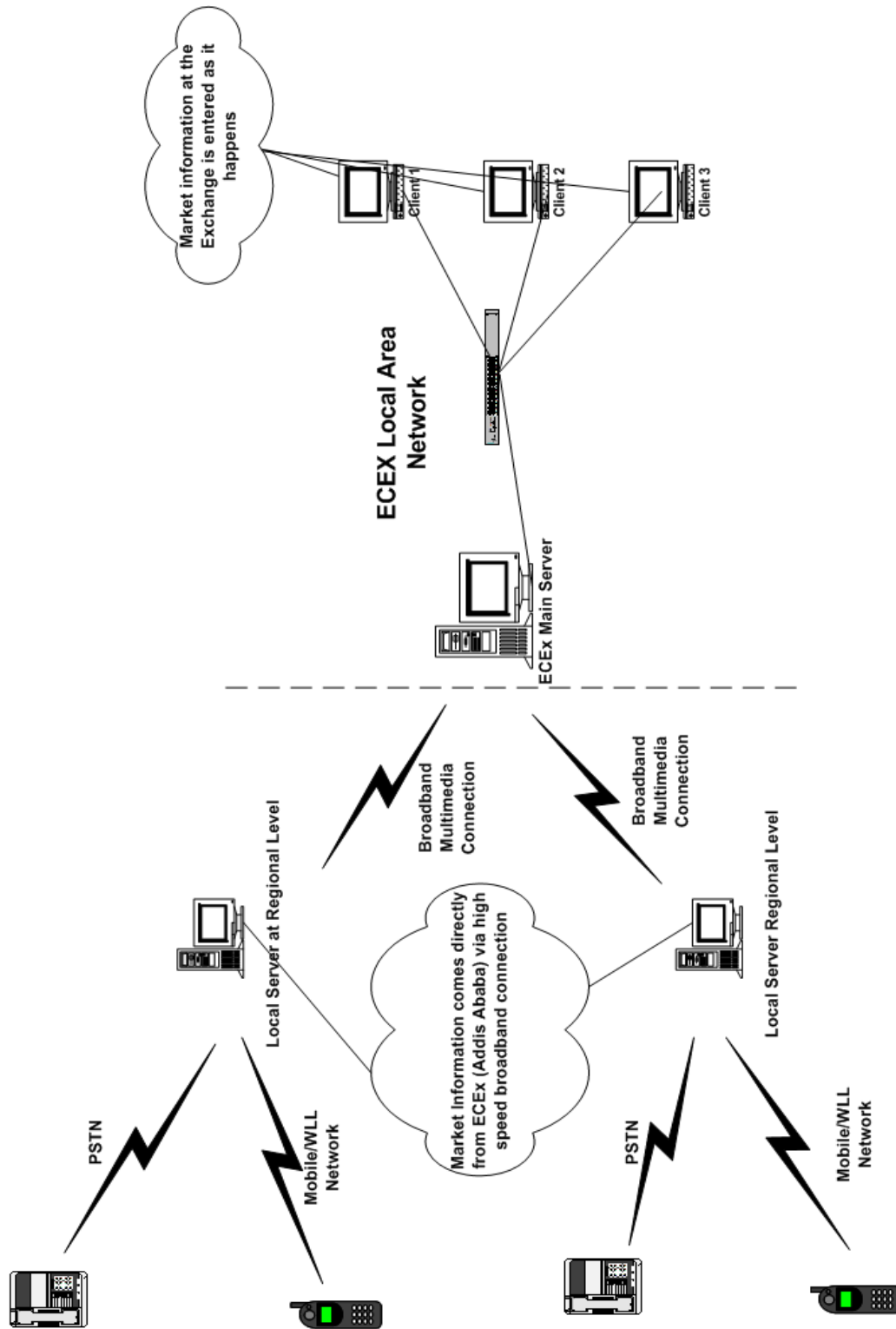
4.1. Proposed Market Information System

Recent improvements in telecommunication and information technology have created many services whose characteristics can benefit communities as well as individuals. One of these services is Interactive Voice Response (IVR), a voice-based service which allows information contained on a computer to be accessed by users through the telephone network.

The proposed Market Information System is IVR based system. IVR systems are based on Computer Telephony Integration (CTI) technology. Users access the proposed Market Information System via the telephone network using their telephone set. They interact with the system by pressing digits on their telephone keypad. For instance, to select option number one on the voice menu they just press one on their telephone keypad then users listen for the next menu options and then they select the option they want by pressing on the telephone keypad. ETC mobile card charging process is an appropriate basic example.

The proposed telephone Market Information System is proposed to work in a distributed environment (see *Figure 9*). The system shall have one main server and several local servers. The main server shall be placed at the headquarters of the Ethiopia Commodity Exchange in Addis Ababa. The main server will be connected to the local area network of Ethiopia Commodity Exchange. The main server together the local servers form the wide area network of Ethiopia Commodity Exchange. Daily market information is entered from the workstations at Ethiopia Commodity Exchange via the local area network into the main server.

Figure 9 - System Architecture of the Proposed Market Information System



At the major cities of the country, a local regional server will be installed. These local servers will be connected to the telephone network on one side and to the wide area network of Ethiopia Commodity Exchange on the other. At the local server, information will be provided in the local languages of the region. For instance, all voice interfaces for the server installed at Mekele will be in the Tigrigna language. Hence, farmers or traders in the region make local telephone call to connect to the local server and they get information in their mother language.

The local servers and the main server are connected via a broadband multimedia connection. When new market information is entered at Ethiopia Commodity Exchange, this information will be transferred via the data link to the local servers making up to date market information available to farmers and traders in the respective region

The proposed Market Information System uses three-tier architecture model, which is the fundamental framework for the logical design model, which segments an application's components into three tiers of services namely, the presentation tier, the middle tier, and the data tier. These tiers do not necessarily correspond to physical locations on various computers on a network, but rather to logical layers of the application.

The presentation tier or more appropriately, user services layer, gives a user access to the application. This layer presents data to the user and permits data manipulation and data entry. The middle tier, or business services layer, consists of business and data rules of the proposed Market Information System. Also referred to as the business logic tier, it is here where all business problems and logic is implemented. The data tier, or data services layer, interacts with persistent data stored at the central database. In fact, this is the actual DBMS access layer. This layer can be accessed through the middle tier. During an application's life cycle,

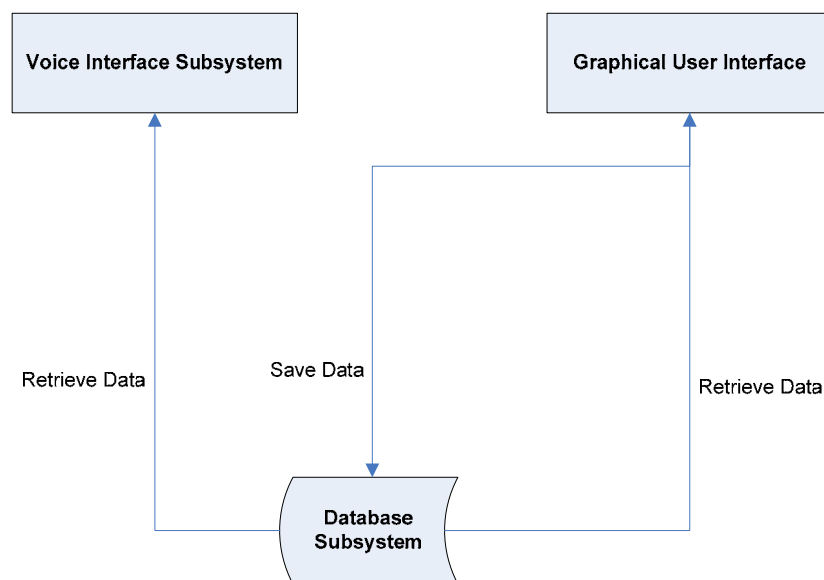
the three-tier approach provides benefits such as reusability, flexibility, manageability, maintainability, and scalability.

4.1.1. Subsystems of the Proposed Market Information System

The proposed Market Information System is decomposed into four subsystems. System decomposition is carried out by carefully considering the functionality of the subsystems.

Figure 10 shows the three subsystems of the proposed Market Information System.

Figure 10 - Subsystems of the Proposed Market Information System



4.1.1.1. Graphical User Interface Subsystem

The graphical user interface subsystem is responsible for handling data validation tasks. This interface will handle user errors, such as invalid data entry. (eg. entering numerical characters where alphabetical text is supposed to be entered). This subsystem also handles the creation and manipulation of all of the forms used in the desktop application of the proposed Market Information System. A call to the user authentication subsystem is required to determine if

any features need to be disabled on the form for the particular user requesting a new form. With the increasing acceptance of the web the capacity of this system can be extended to the web based GUI support.

4.1.1.2. Voice Interface Subsystem

The Voice Interface Subsystem is responsible for handling all voice menus. In addition, all dynamic voice menus are generated by this subsystem. It is also responsible for reading database information to the caller. The subsystem also accepts telephone digits from the user and interprets the instruction and playback the requested information to the caller.

4.1.1.3. Database Store Subsystem

This subsystem is responsible for the storage and retrieval of persistent data such as agricultural products, price information, quantity, etc. The subsystem has facilities used to update the database, respond to external queries, etc.

4.1.2. Software Components of the Proposed Market Information System

The proposed Market Information System has two major software components. The first one is the *Desktop Application* and the second is the *Voice Response Unit*. The Desktop Application is primarily used for data entry and reporting purposes. On the other hand, the Voice Response Unit is mainly used as an interface to farmers and traders, which are located at distant locations, via the telephone network. The two software components are briefly described next.

4.1.2.1. The Desktop Application

The Desktop Application is the application where Ethiopia Commodity Exchange officers enter market information in the database as deals happen. The Desktop Application shall have facilities to capture data in a formal manner.

4.1.2.2. The Voice Response Unit

The Voice Response Unit (VRU) is the interface between the user and the database at Ethiopia Commodity Exchange servers. The VRU accepts inputs from the user and provide required information back to the caller via voice messages. The VRU accepts telephone digits from the user over the telephone network. For example, when a user presses one on the telephone keypad, telephone digit of one will be sent to the VRU via the telephone network. The VRU detects the frequency and identifies the key. Then, depending on the voice menu level, the key pressed will be interpreted accordingly (*See Figure 11*).

The VRU has several pre-recorded vocabulary files. Numbers, names of weeks, names of months and common words used for communication, and application specific voice messages will be recorded and saved at a predefined location having a predefined file name.

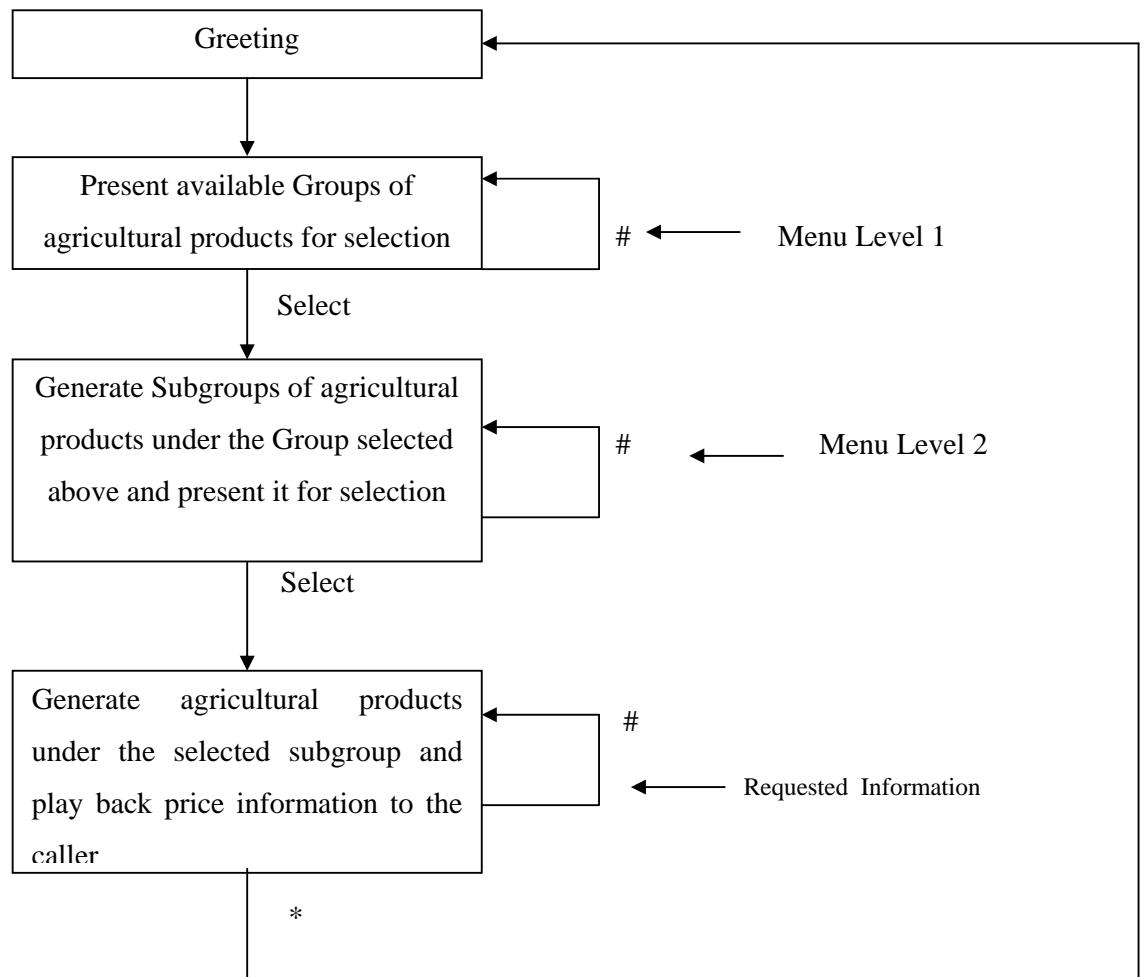
To understand how voice messages are built-up and played to the caller, let us assume that the price of 1 quintals of coffee is 1579.00 Birr. When this information is requested by the caller, the VRU reads the information from the database and uses its vocabulary files to construct on voice message. To accomplish this, the VRU uses the following pre-recorded vocabulary files,

1000.file + 500.file + 70.file + 9.file+ birr.file

By playing back these five individual voice files consecutively, we can completely read the price to the caller. All messages are constructed in this manner dynamically. Hence, the first step in developing Voice Response Unit is recording and building vocabulary files.

More than one language can be implemented in the system. This makes the service friendlier to the users because some inhabitants of rural communities in isolated areas cannot speak English or Amharic very well.

The information stored in the IVR server is related to economic activities in order to stimulate the rural community to increase economic growth in areas such as agriculture. The proposed system can stimulate economic activity in rural areas efficiently. The availability of market information to stakeholders is expected to increase production output. Sometimes rural communities who trade their output to the market center via brokers cannot sell their output optimally because they do not know the list price of their goods in the market. This problem will be reduced by making the price list information available on the proposed Market Information System.

Figure 11 - Voice Menu flow

To facilitate the system menu cards can be developed and distributed to users and basic training can be provided before use.

4.2. Benefits of the Proposed System

Some of the benefits of the Proposed System are the following:

- Auto-attendant – For information delivery, the proposed Market Information System can completely eliminate the need of human interaction from Ethiopia Commodity Exchange side. Information delivery process is fully automated. Callers can access the system and get information via the telephone without the help of Ethiopia Commodity Exchange officers.
- Accessibility - Access to the system is via the telephone network (both fixed, wireless and mobile). Hence, the proposed Market Information System can be reached practically from anywhere. Anyone who has access to a touch tone (not rotary type) telephone can get connected to the system to get information.
- Availability – The system can be made available 24 hours a day, 7 days a week, and 365 days a year.
- Easy to use - The system can be accessed just by dialing a specific phone number. Unlike using computers, everybody knows or can easily learn how to use a telephone. Hence, users do not need to have high technical skills; anyone who knows how to use a telephone can use the proposed Market Information System to get market information.
- Live Information - Since the system is connected to the database at Ethiopia Commodity Exchange, live and up-to-date information can be delivered to farmers.
- Multiple Serving - The system can handle more than one simultaneous calls at a time and its capacity can be upgraded to accommodate more simultaneous calls.
- Acceptability - The system is equipped with voice menu messages, in the local language of the region, that guide the user throughout connection time. Hence, easy to use for farmers.

- Language - The system can support any of the local languages. Hence, information for farmers is presented in their own local languages.
- Training - The system can also serve those who cannot read and write, anybody who knows how to make a telephone call can use it.
- Network connectivity and Administration – The system can be connected to a TCP/IP Network enabling administrators to configure the system remotely.
- Standard Telephony - No specialized telephone set is required. Any standard telephone set can work with the system (except rotary type of telephones)

CHAPTER 5 - Conclusions

The provision of basic market information is a service that aims to increase the efficiency of Ethiopia Commodity Exchange and contribute towards overcoming basic issues of market failure based on asymmetrical access to information. Access to spot prices assists farmers 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.

It is clear that there is a considerable demand for better Market Information System, and also 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. A major lesson is that indeed information is power: smallholder farmers in rural areas are being empowered to bargain for better prices in the market place.

Relevant and timely market information packaged and delivered by low-cost technology based systems can improve the competitiveness of smallholder farmers in the market place for better prices. Access to better markets and better prices mean better incomes for the farmer, ensuring food security and a means out of the vicious cycle of poverty and food insecurity.

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

Currently in Ethiopia, farmers do not have efficient mechanism of market information access. Radio and Television broadcast give farmers limited price indications of a few agricultural products at selected markets across the country. Due to lack of market information, farmers sell their agricultural product to merchants from the cities at very low prices. Because of this, living conditions of farmers is deteriorating day by day. This has a direct impact on the economic development of Ethiopia since around 85% of the population lives in the rural parts of the country.

At the beginning of this project, Ethiopia Commodity Exchange's existing market information requirements were collected and studied. Relevant country wide information was explored. In addition, the experience of other commodity exchanges was investigated. During the system study process, nine Market information System solutions were identified namely, *Mass Media (Radio and Newspaper) Based System*, *Mobile Phone Short Messaging Service (SMS)*, *Interactive Voice Response (IVR) Based System*, *Email Based System*, *Plasma Display Based System*, *Market Information Points (MIPs)*, *Telephone Based Query System*, *Website Base Market Information System*, and *Word of Mouth Based System*.

In order to select a feasible Market Information System solution, eight reasonable evaluation criteria were devised. The evaluation criteria are, Accessibility, Availability (24/7), Ease of use, Implementation and operational cost, Information on demand, Localization for rural areas, Minimum technical skill required, and Real-time information delivery. The evaluation criteria developed took into consideration the educational situation of the country, technological trend, the existing infrastructure of the country, and the requirements of Ethiopia Commodity Exchange. By applying the evaluation criteria, out of the short listed

solutions one is selected. Finally, a high level system design of the selected Market Information System is developed and proposed.

The proposed Market Information System uses IVR based technology to deliver information. In the Ethiopian context, IVR based systems can be very practical for delivering information to rural areas. In the countryside where computer network infrastructure is not available, using the existing and fast expanding mobile/fixed telephone network for information services would be an ideal solution.

Callers interface with the IVR based system through the telephone keypad. Very little technical knowledge is required to use IVR systems, in fact, no computer knowledge is needed. Given very little training, farmers who just know how to make a telephone call can use IVR based systems to get market information. Hence, with minimum training and minimum infrastructure cost IVR based systems can be implemented in the rural Ethiopia to deliver valuable market information to farmers.

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Appendix I – Interview Schedule

Target: Dr. Eleni Z. G/Madhin

1. Does Ethiopia need a Commodity Exchange?
2. What is the significance of this type of market to Ethiopia?
3. Is Ethiopia ready?
4. Are derivative going to be traded at Ethiopia Commodity Exchange?
5. When are you planning to launch the exchange?
6. What is the Vision of the exchange?
7. What is the general setup of the Ethiopia Commodity Exchange?
8. What is a warehouse receipt?
9. How is trading conducted?
10. What are your plans of Market Information System implementation?
11. Have you decided on a specific Market Information System solution yet?
12. Have you started procurement or implementation work?
13. What is an electronic trading center?
14. How many electronic trading centers are planned for Ethiopia Commodity Exchange?
15. Where are these electronic trading centers located?
16. Why did you select these locations?
17. What is a Plasma Display installation?
18. How may Plasma Display installations do you plan for Ethiopia Commodity Exchange?
19. How do you plan to connect the Plasma Display screens with Ethiopia Commodity Exchange?

20. What other solutions of network connectivity other than WoredaNet are you exploring now?
21. What are the issues that are important for you in selecting Market Information System?
22. How do you rate the relative importance of each issue?

Declaration

I, **Mesay Zegeye Worku**, declare that the study entitled “**Market Information System and the Ethiopia Commodity Exchange**” is the result of my own effort in research undertaking. The study has not been submitted to any Degree or Diploma in any college or university. It is submitted for the partial fulfillment of the requirement of the Degree of Master of Business Administration.

Mesay Zegeye Worku