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ICT Adoption Model for Ethiopian Banking Industry

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BY

MESERET YOHANNES

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Dedication

To my father!

Acknowledgements

Completing this research, which has proved to be more frustrating than I had anticipated, would have been very challenging if it were not for the help I received in many forms. I would like to use this prologue, which has provided a pleasant opportunity to thank everyone who has extended a valuable criticism, suggestion, or encouragement.

For the ever ending assistance He rendered throughout this process, for my provider of wisdom, understanding and everything I have now, I thank my Lord God.

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Acronyms

ABP.....	Automatic Bill Payment
ATM.....	Automatic Teller Machine
CRM.....	Customer Relationship Management
E-commerce.....	Electronic commerce
E-invoices.....	Electronic invoices
E-home.....	Electronic home
E-office.....	Electronic office
E-signatures.....	Electronic signatures
ETC.....	Ethiopian Telecommunication Corporation
fsQCA.....	fuzzy set Qualitative Comparative Analysis
ICT.....	Information Communication Technology
ISP.....	Internet Service Provider
IT.....	Information Technology
LAN.....	Local Area Network
QCA.....	Qualitative Comparative Analysis
SPSS.....	Statistical Package for the Social Science
WAN.....	Wide Area Network
VAT.....	Value Added Tax

Abstract

A report produced by United Nations Environment Program Finance Initiative in 2009 has grouped the Ethiopian banking industry among the lowest bank infiltration countries and the remedy suggested for the improvement of the situation was incorporating ICT in to the industry. ICT with its every changing and every growing facility has the imperatives to unify the world by creating ubiquitous communication and connection. The nature of the banking industry with its distributed working and market places, geography could be a problem or an opportunity and only the use of ICT could make geography an opportunity. Needless to say, ICT is one of the most important drivers of change and revolution in the banking and finance sector.

The research has intended to find out the current environment concerning ICT and the banking industry with the major objective of finding the reasons behind adopting ICT. To identify the drivers of ICT adoption in the banking industry, seven factors were selected. The factors were diversified, though they are not completely autonomous individually. An effort has been exerted to create a vantage point from every angle where drives of ICT adoption could be found. The result of the research was a model built from the factors illustrating which combination factors will be a cause of ICT adoption and which combination could hinder ICT adoption. The ICT adoption model and other information collected concerning the banking industry has been used to provide recommendations concerning the national ICT policy as well as the enterprise ICT policy.

The values of the research result could be seen as an input or an output. The output part constitutes the ready to be used information about ICTs in the banks, the influence of ICTs on the banking activities, and factors hindering the banks from further advancement in adopting ICT. The result could also be used as an input for further research about utilizing ICT in every sphere and finding the drives of ICT adoption in different industries.

Chapter 1: Introduction

This chapter focuses on discussing general background of ICT, ICT in Ethiopian banking industry, objectives, and methodology of the research. It aims to create a common platform for understanding the research and its' expected outcome.

1.1. Background

Information and communication technology (ICT) which is a combination of computer and telecommunication devices (satellites, optic fiber, telephones...) is used to collect, process, store, and disseminate information or knowledge (Agboola, 2005). ICT has changed the world and all that is in it; the way people live, do business and communicate has changed. The ease and frequency of communication has changed dramatically because of the services available using ICT. Globalization which is a direct result of ICT, has made doing business internationally much easier. As a result, the twenty first century world economy has relied more on information, information related resources, and information related business. ICT has created an industry and a society, the information industry and the information society respectively. However, it would be an overstatement to claim the whole world becomes a part of the information society all at once.

For the developed world, the making of information society was a timely transition from the industrial society. When information takes center stage in many industries and business operations and become source of economical advancement, a shift of focus from machineries to information was expected. On the other hand, the developing world faced an inevitable dilemma of choosing either being left out or being part and beneficiary to the economical advantages of ICT (Economic Commission for Africa, 1996). Meanwhile, access to information and communications technologies has become increasingly critical for the developing countries' participation in economic and political arena at national, international, and global levels. Beginning at the dawn of the twenty first century there has been many changes that have aligned the developing nations with fast changing world of ICT.

The change has brought a difference in the participation of developing countries in the world economy. Different mechanisms have been implemented to assist these countries on achieving a level of ICT adoption, which can provide the countries the beneficial boost. One of these was technology transfer; which has made most of the developing countries owners of outdated ICT gadgets that has been generously donated by the Western world (Mistry, 2006). In addition, the United Nations has issued an agreement to establish a special fund to promote the use of science and technology to help the poor and developing nations. Furthermore, the universal access program was designed to achieve a goal of enabling everyone in the developing nation have an access to basic ICTs. Another mechanism, which recognizes the infeasibility of achieving a goal of making individuals in developing world the owner of ICTs start with a modest objective of bringing these technologies to serve the population at the community level (James, 2006). In addition to having these supports, the product differentiation market strategy has provided technological equipments with affordable price specially produced for the markets of the developing countries. Computers, network devises, and Internet services have become fairly available. The digital divide was improving: the World Bank has issued a report in 2005 on how the differences between developing and developed countries have elapsed even though developing countries still have a lot of catching up to do compared with the developed world with regard to digital literacy, availability of relevant content, affordability of access, quality of networks, universal access, universal service and better infrastructure development (Mutula, 2007).

As many of the developing countries, level of ICT adoption in Ethiopia could be considered least developed in which most of ICT, ICT based services, and ICT infrastructure services segregated in major cities and towns, particularly Addis Ababa. Consequently, while the Internet and other forms of ICT are fairly available in Addis Ababa, limited access to ICT and ICT based services by the rural population continues to be a major obstacle in implementing ICT at national level and hindering adoption and utilization of ICTs (Kebede, 2009). Taking in to consideration the status of ICT development, lack of reliable ICT infrastructure and unavailability of holistic country level ICT policy in Ethiopia; computer assisted manufacturing, airline business, banking,

insurance, health, government and education has shown acclaimed steps forward. From all business sectors, the banking industry is experiencing technological metamorphoses.

1.2. Background of Ethiopian Banking Industry

Modern banking in Ethiopia was introduced in 1905 almost a century ago with the first bank, Bank of Abyssinia, being inaugurated the following year (National Bank of Ethiopia, 2009). The banking industry though it is still at its infancy stage has come a long way. The number of banks operating in the country in 2008/09 has reached sixteen, of which thirteen are private (Dashen Bank, Construction and Business Bank, Awash Bank, Abyssinia Bank, Wegagen Bank, United Bank, Nib Bank, Cooperative Bank of Oromia, Lion Bank, Zemen Bank, Oromia International Bank, Buna International Bank and Berhan International Bank) and the remaining three are government owned (National Bank of Ethiopia, Commercial Bank of Ethiopia and Agricultural and Industrial Development Bank) (National Bank of Ethiopia, 2009). The liberalization of the financial sector to the public has revolutionized Banking Industry. As the number of banks increase with diversified and intensified competition, many banks have responded by reengineering their process to accommodate the complexity of the business transaction, reduce cost of operation, and maintain competitive advantage. ICT has played the major role in this dynamic and global industrial change.

The survival and competitiveness of every bank in the twenty first century highly depends on how well all business transactions of the bank are allied with ICT (Agboola, 2005). ICT has provided the banking industry with range of technologies that has replaced the traditional banking systems with electronic banking systems as well as provide new ways of doing the banking activities with efficiency and effectiveness. The technologies could be a stand alone computer, WAN and LAN networks, telephone banking, Internet banking (include services like webpage, e-home and e-office banking), Automatic Teller Machine (ATM), smart cards, Magnetic Ink Character Reader (MICR), electronic fund transfer, electronic data interchange, computerized credit rating, networked tele-centers and Automatic Bill Payment (ABP) (Agboola, 2005; Zhu et al., 2004; Nelson, 1999). The advancement and adoption of these technologies have enabled banks around the world to deliver banking services anywhere anytime; literally banks

could serve their customer anywhere in the world twenty four hours a day and seven days a week. In addition to changing the overall working environment of the industry, ICT has benefited banking in varieties of tangible and intangible profits. ICT has changed the way the bank operates by reinventing improved work structure, creating better strategy, developing efficient management decision, providing controlled error rate and improving performance, as well as make the banks profitable by reducing operating costs, enhancing faster services, ensuring convenient business hour and providing quality of service for customer. Furthermore, ICT has opened many doors for banks in the competitive advantage arena and add value systematically to the bank by improving the overall image of the bank (Agboola, 2005; Mistry, 2006; Zhu et al., 2004). These benefits have created an inclination of increased ICT adoption and utilization anywhere as it is the case in Ethiopia.

The banking industry in Ethiopia has shown tremendous changes in the overall provision of banking services with developments of ICT over the years. The quest for survival, effects of globalization, and the need to maintain the existing market share has made exploitation of the many advantages of ICT through intensive investment on banking technologies. Banks in Ethiopia have spent heavily on technology over the past few years. For instance, the networking project of Commercial Bank of Ethiopia, Construction and Business Bank's branch financial systems software development project, the systems' upgrading project of National Bank of Ethiopia, Dashen Banks networking, ATM and related ICT infrastructure, and the Internet Banking initiated by United Bank are some of the major Information technology related investments (Redda, 1999). As in 2009, the three private Ethiopian Banks, Awash International Bank SC, Nib International Bank SC, and United Bank SC have started 40 million birr project to install integrate Automated Teller Machines (ATMs) that can be used by all customers of the three banks (National Bank of Ethiopia, 2009). However, investment on ICT does not always guarantee profitability. A thorough analysis on questions like; what kind of ICTs are available on the market, the level and accommodation of ICT infrastructures in the country, the worth of ICTs, the why of investing on ICT and the actual and expected benefit of the technologies would assist in harvesting the promised benefits of ICT. ICT

adoption models have been helpful in assisting many organizations in selecting the right track to profitable ICT adoption by answering the above questions.

1.3. Statement of the Problem

The research strives to answer two questions: what are the major drives of ICT adoption in the banking industry of Ethiopia, and what would be the appropriate ICT adoption model suitable for the case of Ethiopian banking industry?

ICT could improve financial sector, assist the development of private sector, be the backbone of trade and global competitiveness, and support delivery of infrastructure and social services (transport, telecommunication, information systems, and networks) for a country like ours. Currently, many organizations have increased and will increase further investments in ICT, which has raised productivity in most business processes and has resulted in an increase in the quality and speed of work, better financial controls and communications, access to larger and new markets and simpler access to common data. However, the liberalization of the financial sector in the country and the intensified competition has made banks desperately dependent on ICT that most of the banks would invest on any ICT that is on a market and any ICT their competitors have adopted (Mistry, 2006). This would lead the banks into productivity paradox of ICT: not every ICT adopted by the banks resulted in being profitable. The research tries to formulate a guideline by identifying the major drives for ICT adoption and their implication in the business using ICT adoption models.

ICT adoption models are manifestations of different theories that have been embraced by different industries and types of organization to identify factors that drive an organization to adopt ICT. In addition, ICT adoption models have been used as a framework for selecting the right type of ICT by organizations. Many theories have been suggested to build ICT adoption model from the perspectives of factors that affect ICT adoption most. Among these Rogers' diffusion of innovations, Ajzen and Fishbein's theory of reasoned action, Davis' the technology acceptance model, Taylor and Todd's theory of planned behavior, and Campeau and Higgins' social cognitive theory are the most popular ones (Manueli et al., 2007; Yang et al., 2007)

Ethiopian banks could have used ICT adoption models already developed to assess the current ICT adoption drivers. Using the already developed ICT adoption models is not a feasible solution because most of ICT adoption models are developed by taking in to consideration factors which are found to be important in the developed world that are characterized by stabilized economy, and an ICT infrastructure with good coverage and services. According to most of the ICT adoption models, the major factors were summarized as innovation (technical), organization, task level, environmental and individual (Bagchi and Udo, 2007). On the other version corporate strategies, organizational resource and management style have been picked as important factors for ICT adoption (Yang et al., 2007). The above list of factors has neglected some of the factors that could have a greater impact on ICT adoption by developing countries. Factors that have importance for the case of Ethiopian banking industry includes; infrastructural problems, socio-economic problems, language barriers, inadequate information and telecommunication policy, low literacy level of the society, the information seeking culture of the community, high cost of ICT, business environment (financial and legal issues of business), financial and human resource available for ICT infrastructure building and utilization, and the rapid change of technology in the rest of the world (Bagchi and Udo, 2007; Dagneu, 2000). This problem could only be solved by creating a custom made ICT adoption model, which has the salient features of the Ethiopian banking industry in to consideration. The final output of the research is a model, which will satisfy most of the above requirements.

1.4. Objective

General Objective

The general objective of the research is developing ICT adoption models for Ethiopian banking industry that could be used as a framework for enterprise level ICT policy.

Specific Objective

- Identify ICTs that have been adopted by the Banking industry.
- Pinpoint driving factors of ICT adoption.

- Determine causes that have hindered ICT adoption.
- Identify perceptions on the influence of ICT on the industry.
- Construct level of ICT adoption among the banks.
- Profiling banks based on level of ICT adoption.
- Build ICT adoption models.
- Create ICT policy framework for Ethiopian banking industry.

1.5. Scope

The Banking sector has shown a dramatic growth in ICT adoption compared to other sectors in the country. For this reason, the research would only consider the Banking sector of the country to build ICT adoption models. In addition, banks with head offices located in Addis Ababa are considered for the research. Because of lack of literature on the existing ICT adoption level of different banks, the researcher is obliged to study all banks, which are operational as of the research time.

1.6. Research Contributions

The contribution of this thesis could be viewed from three perspectives. First, the banking industry will be enlightened with facts about the available ICTs and on common problems banks are facing concerning ICT development. On the other hand, the research shows ways of formulating ICT policy to policy making bodies in implementation of a policy geared towards influencing the banking industry. In addition, the research provides knowledge for the public concerning ICT in the banking industry and researchers could use the result of the research as a springboard for further study. The major contribution of the research is the new model that explains the current ICT drives in the banking industry of Ethiopia, which could be considered as a unique contribution of the research.

1.7. Outline of the Thesis

This thesis is divided into six chapters: Introduction, Literature Review, Methodology, Data Analysis, ICT Adoption Model using fsQCA, and Conclusion and Recommendation. The first chapter, Introduction, includes the background of the study, the objectives of the research and statement of the problem as a major topic. In Literature Review, conceptual literature about ICT adoption models and the major research approach, Qualitative Comparative Analysis (QCA) are presented. In addition, the second chapter covers related literature of banking and ICT. Third chapter, Methodology, shows the general research approach which is expressed in topics like Research Design, Research Population, Sampling Technique, Data Collection Method, Quality of the Research tool, and Data Processing and Analysis. The data analysis of the research was divided into two chapters: Data Analysis and ICT Adoption Model using fsQCA. In the Data Analysis chapter, the quantitative results of the research are discussed supported by different statistical summarizations. The ICT Adoption Model using fsQCA chapter deals with the process of building the ICT adoption model and illustrates the ICT adoption model and its' features. The last chapter, Conclusion and Recommendation, covers the Research Question, Conclusion, Recommendation, and Further Research.

Chapter 2: Literature Review

The trend of increased dependence on information technology by organizations in all industries leads us to questioning how firms evaluate the impact of different factors on adopting ICT. The literature has various studies related with determining the best ICT adoption models that would formulate a framework of assessing different factors and their influence on adopting ICT. In this part of the document, in addition to ICT adoption models and the methodological background of the study, related literatures about ICT adoption for banking industry would be comprised.

2.1. Theoretical Framework

Since the research has taken the objective of building ICT adoption models, it would only be appropriate to describe some of the most prominent ICT adoption model that are circulating in the academic research area related with ICT. The models discussed below are to be used as a foundation for the model to be built and it should be noted that all ICT adoption models are not comprehensively discussed.

Diffusion of Innovations Theory

The diffusion innovation model was popularized by Everett Rogers around 1960 (Eriksson et al., 2008). Diffusion is the process by which an innovation is communicated through a designated communication channels over time among the members of a certain social group (Eriksson et al., 2008). The theory comprises four elements: invention, diffusion through the social networks (communication channel), time, and consequences. Diffusion of innovation theory focuses on bringing the basic elements innovation; the communication channel, the rate of adoption, and the social system, which will guide the process of innovation, to their effect on decision makings (Manueli et al., 2007; Eriksson et al., 2008). Individuals as a single user or group of individuals as a society could make the decision.

Rogers have categorized the steps in which users take to adopt an innovation: knowledge, persuasion, decision, implementation, and confirmation (Manueli et al., 2007). Users in the same social framework, through a series of communication channels and over a period of time would pass through these steps. Though rejection of innovation could happen at any of the stages, the decision stage is where users are supposed to choose rejection or acceptance of the innovation.

Steps of the adoption process in diffusion innovation model are:

- Knowledge: The knowledge stage is characterized by the lack of sufficient information by the user while awareness about the innovation is apparent. In addition, users are not motivated enough to dig deeper and know more about the innovation.
- Persuasion: Persuasion shows the information seeking behavior of users, which is manifested in the need to know more about the innovation. This is where interest about the technology starts to build up among users.
- Decision: After users are well acquainted with the innovation, the decision about whether to accept or reject the innovation would be made after a thorough analysis of the advantage and disadvantage associated with the innovation. What makes the decision stage the most difficult for analysis and study is the individualistic nature of the drives that would affect the reject/accept decision.
- Implementation: The implementation stage varies from individual to individual. It is finding more about the usefulness of the innovation and could involve learning more about it through time.
- Confirmation: The confirmation stage could mean that users have decided to use the innovation or users are committed in using the innovation fully.

While each individual might pass through the adoption steps at some time, each one will have his or her own pace different from the other. There are intrinsic characteristics of innovations that influence an individual's decision to adopt or reject an innovation. These characteristics include the relative advantage that compares the innovation with its

predecessors for new features and improvements. Compatibility is the second characteristic; users would have to check if the innovation is compatible with the way they have been running their life and work environment. In addition to this complexity of the innovation, trialability; the ease of experimenting with it and observability; the extent that an innovation is visible to others are the major characteristics that affects the adoption of innovation (Olatokun and Igbinedion, 2009; Kolodinsky, 2004).

Taking the above characteristics in to consideration and the rate of adoption, which is the relative speed with which members of a social system adopt an innovation there are five categories of individuals in a specific system (Yang et al., 2007; Manuelli et al., 2007). Innovators: innovators are mostly young risk takers who are not afraid to have a financial loss. Early adopters: early adaptors follow the innovators in a close distance, most are leaders and more social forward than innovators. Early majority: individuals in early majority are the largest numbers to accept the innovation though it would take them a longer period. Late majority: late majority are the skeptics who accept the technology but lacks confidence in the innovation. The final category includes laggards: these are individuals who are not a fan of change that would transform their stable working environment in to chaos with complex technologies and intensive training.

In conclusion, Rogers' diffusion of innovation model can be used to explain about why some people or organizations are in the front of accepting and adopting innovations and why others are lagging behind. The model gives a comprehensive framework by covering almost all important features that affect adoption of an innovation.

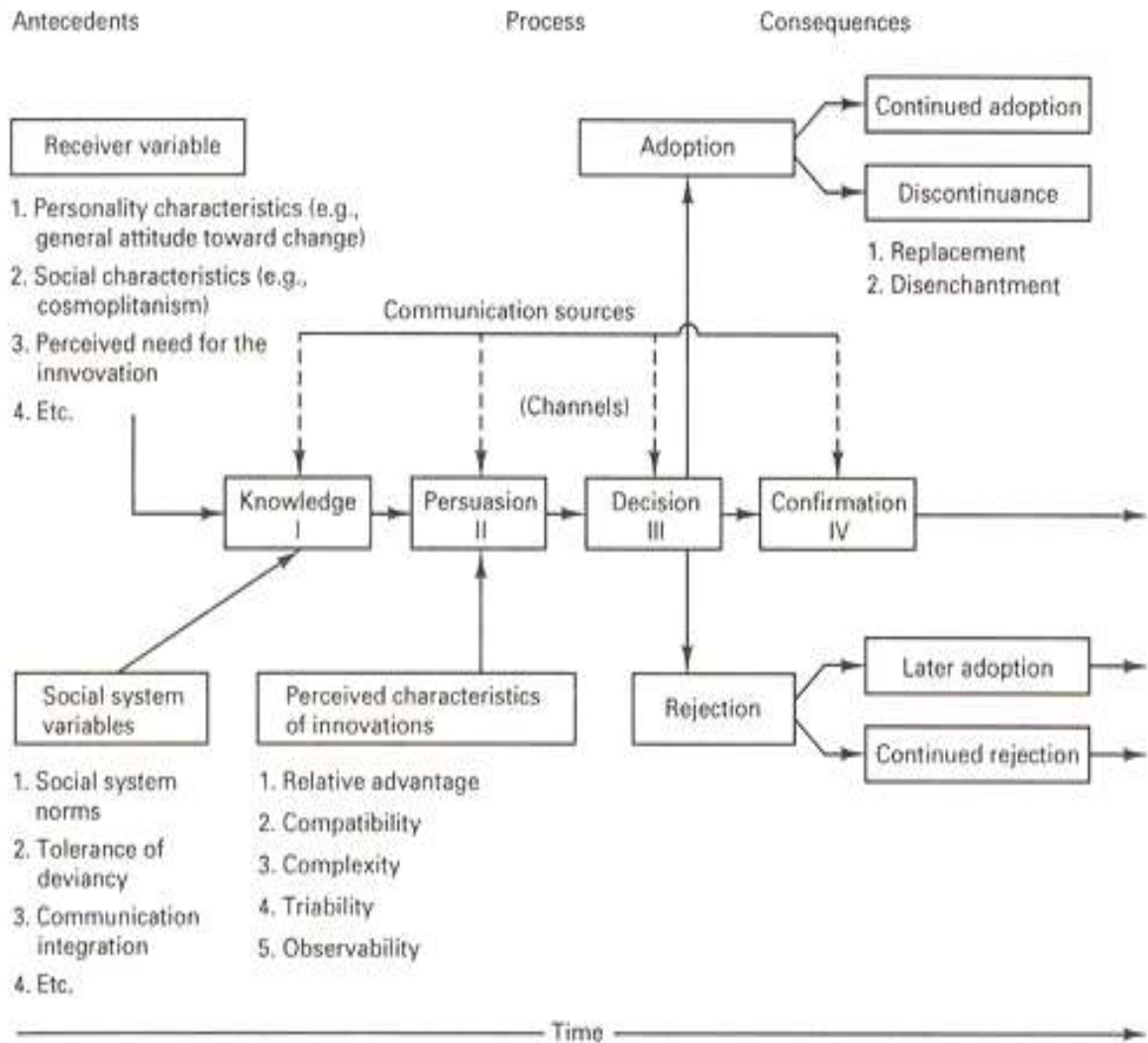


Figure 2.1: Rogers' diffusion innovation model

The Theory of Reasoned Action (TRA)

Theory of Reasoned Action (TRA) is a model, which has been successful in predicting and explaining the behavior of users in different spheres of influence including in researches of technology acceptance and adoption. TRA's concepts and framework is based on analysis of the difference between beliefs, attitudes, intentions, and behaviors. According to TRA, a person's action of a specified behavior is determined by the behavioral intention to perform the behavior (Sandberg and Wahlberg, 2002). On the other hand, the intention behavior is determined by the person's attitude and subjective

norms concerning the behavior. Generally, TRA states the belief and attitude of a person will formulate patterns, which will guide the persons' overt actions and decisions.

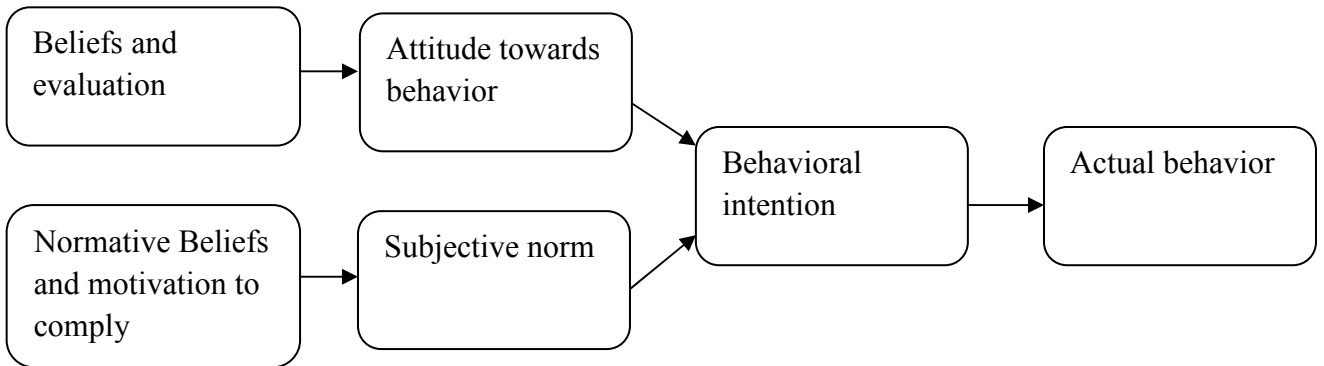


Figure 2.2: The theory of reasoned action model

The implication of TRA in technology acceptance and adoption is usually at individual level describing the psychological arena for accepting and rejecting a certain technology. In conclusion, TRA suggests the decision of accepting a new technology will depend on the person's belief on the expectations of the norm from the person. This is to refer to situations when a technology user perceives people of influential position are using a certain technology and expects for the user to follow the lead on adopting this technology, the user is obliged in to incorporating these people's behavior in to his/her own behavior pattern (Sandberg and Wahlberg, 2002).

The Technology Acceptance Model (TAM)

Another influential model is TAM, which has a relation with the TRA framework. TAM has narrowed the scope of TRA theory by focusing on two key factors which has make TAM less general in scope and compatible to every type of technology adoption scenario. The key factors in case of TAM that are intended to influence user acceptance of a technology are perceived usefulness and perceived ease of use (Manueil et al., 2007; Kolodinsky, 2004). The above two variables and other external factors will determine the user acceptance in a given technology.

Perceived usefulness is the extent to which a person believes a particular technology is valuable for the job at hand. Most people associate acceptance of technology gadgets directly to the improvement in performance that comes with the technology. Perceived usefulness is all about determining the users perception concerning the technology and its' associated performance improvements which are manifested though less time on a job, efficient and effective performance and overall change in the workplace (Sandberg and Wahlberg, 2002).

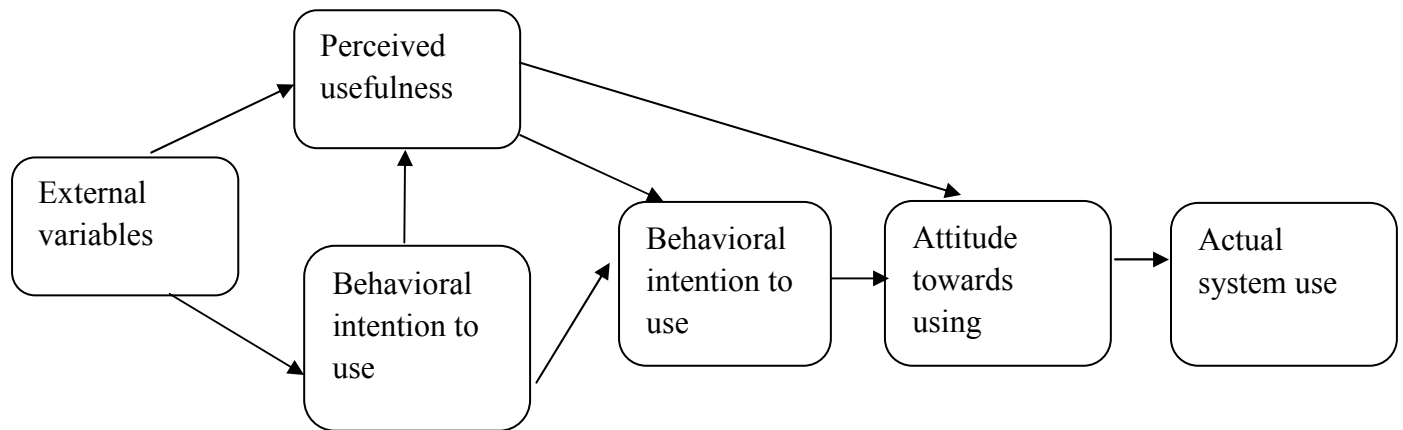


Figure 2.3: Technology acceptance model

One of the greatest challenges in technology acceptance is user resistance. Though user resistance has many reasons behind it, one of the major one is fear of learning complex system to use the technology properly. The second key factor in TAM focuses on this issue. Perceived ease of use refers to the persons' believes that mastering a technology will require a lot of effort. In this kind of scenario, a user is obliged to weight the benefit of the technology with the hardship it brings through training and learning. In perceived ease of use, we can conclude the extent the users will actively participate in using a technology is directly proportional with the level of effort required to master the technology (Sandberg and Wahlberg, 2002).

TAM has been a very helpful model in understanding the behavior of users against perception of usefulness and perception of ease of use factors to determine which ever is

driving the adoption of ICT. TAM has proven to be the best model in researches about online shopping, Internet banking, and online learning.

Theory of Planned Behavior (TPB)

The Theory of Planned Behavior is another type of behavior based models which steer its' wheel on conditions where individual user has no control on their behavior and associated action. TPB is extended from the TAM with better predictive power. The major factors according TPB are attitude, perceived behavioral control, and subjective norms (Fink et al., 2005). While attitude express the pessimistic and optimistic perspectives of the users towards the new innovation, behavioral control describes the individual's beliefs on having the required resources and opportunities needed for performing the intended actions and the standard of the individuals' personal stand which represent the subjective norms. TPB has a variety: Decomposed Theory of Planned Behavior (DTPB).

The underlying concept of the DTPB is the assumption that people are often lucid and are capable of efficiently using the available information to guide their action. Thus, identifying, measuring, and decomposing the above factors for determining an individual's behavior result in the understanding and prediction of individual behavior in much better perspective (Fink et al., 2005). DTPB has proved to be universally acclaimed intention finding model that has been successful in predicting and clarification human behavior in different spheres by decomposing it into specific dimensions.

Comparing the pure or traditional TPB and the decomposed TPB the balance has shifted to the DTPB for its power of explanation of the three factors: behavioral intention, attitude, and subjective norm. The decomposition process in DTPB has added a value in understanding the behavior of the users.

Unified Theory of Acceptance and Use of Technology

The Unified Theory of Acceptance and Use of Technology (UTAUT) take in to consideration new factors that bear a tremendous amount of influence on the behavioral intentions and the usage of the technology. The new factors extends TAM to take into

account several new concepts like performance expectancy, effort expectancy, facilitating conditions, and social influence to explain the perceived usefulness and perceived ease of use (Sandberg and Wahlberg, 2002).

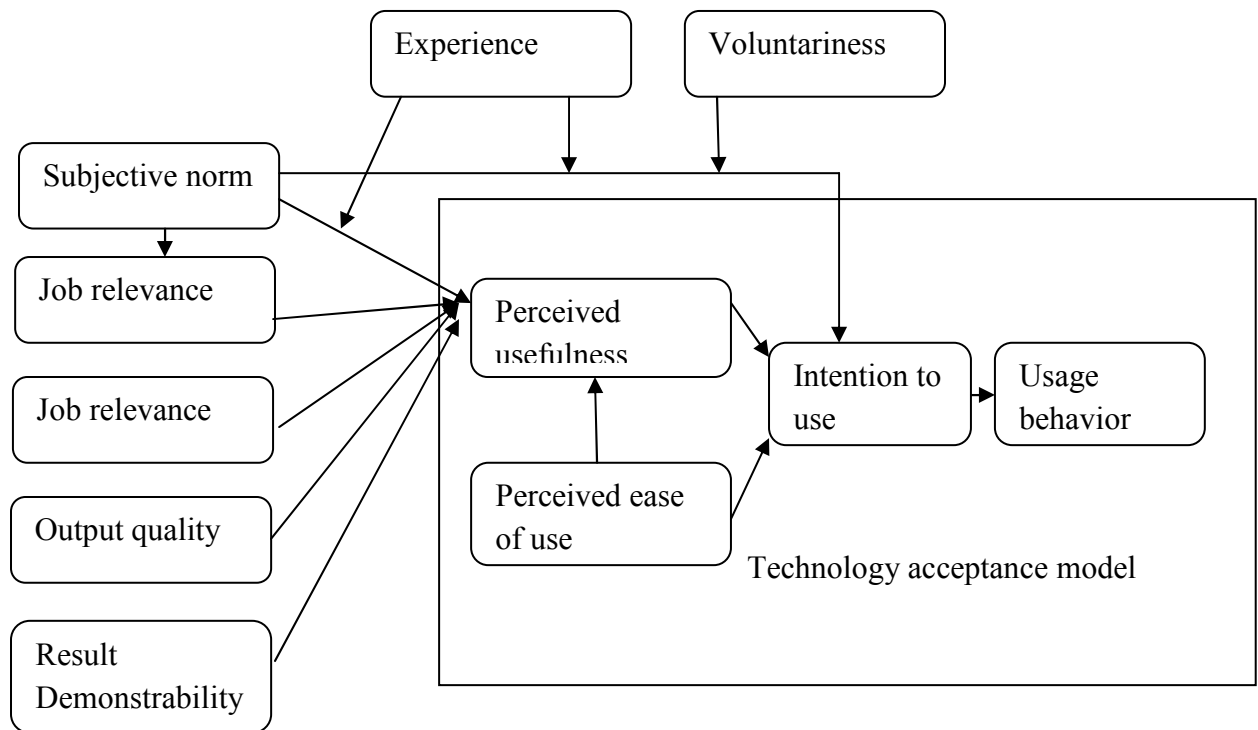


Figure 2.4: Unified theory of acceptance and use of technology model

The UTAUT model was designed according to an observable similarity of concepts across eight outstanding and rival technology adoption models: Technology Acceptance Model (TAM), Innovation Diffusion Theory (IDT), Theory of Reasoned Action (TRA), Motivation Model (MM), Theory of Planned Behavior, Combined TAM and TPB, Model of PC Utilization and Social Cognitive Theory.

The major impediments to ICT adoption models stated above is the lack of tailored ICT models that could serve the Ethiopian banking industry with its current status of ICT usage, the country’s ICT infrastructure level, the economic level of the customers, and

the enterprise and country level ICT policy. The models discussed can be used as a base for identification of different ICT drives and help the model customization process in the research.

2.2. Methodological Considerations

In this part of the literature review, the methods and techniques that are to be used for the research are discussed. The research has follow tools and techniques of a comparative analysis technique specifically Qualitative Comparative Analysis (QCA). In addition, the QCA is united with the fuzzy set techniques to analyze the data that has been gathered.

Comparative Analysis

In Comparative analysis researchers study categories of cases, which are defined based on a certain theory or concept, with the goal of getting meaningful patterns from both individual cases and clusters of similar cases using the relationship between cases and knowledge about individual cases. In comparative research, the researcher uses theoretical and practical knowledge as a guide to construct a well studied set of cases with boundaries delimiting each case for individual case assessment. The flexibility of the boundary that delimited the cases will change from adaptable to permanent as the research proceeds, which come from knowing more about cases through new concepts, interactions of cases, and different ideas in a progressive manner. When it comes to the nature of cases, comparative researchers often need to make comparisons among cases, which call for the availability of diverse cases in the research. At the same time, the diversity of the cases should not eliminate case homogeneity because the cases will finally share the same outcome. Thus, comparative researchers need to balance the number of cases that are diversified while keeping their homogeneity (Ragin, 2005).

In comparative analysis, testing of existing theory is not an accustomed procedure due to lack of theories in comparative research. The major hypothetical objective of comparative research is not theory testing, but concept formation, elaboration, and refinement and in rare cases theory development if hypothesis could be formulated as part of the comparative analysis (Ragin, 2005). Comparative analysis focuses on finding configurations of causally relevant characteristics about cases for determining how the

characteristics fit together to get a meaning out of the case. In addition, cross case analysis is used to form patterns out of cases and strengthen the value of within case analysis. To the extent possible, comparative researchers try to balance cross case and within case analysis. Qualitative comparative analysis (QCA) is part of comparative analyses techniques.

Qualitative Comparative Analysis

Researchers that are striving to come up with a theory or a model could use a case study as a means of achieving their objective. The most significant nature of case studies is the narrowness of the cases: small number of cases, which makes it difficult for the result to be inferred to fit an entire question of the research, characterizes case studies. Social science researches, which use statistical measurements, are usually accompanied by sufficient data or cases for inference. On the other hand, case studies provide a more realistic result than a purely statistical survey on many social researches. The best solution lies between the two and it is recommended for researchers with case studies to try and synergize the two approaches (Rihoux, 2003). It is valid to conduct case studies but they should be tied in with more general statistical processes which is what qualitative comparative analysis is tiring to achieve.

Qualitative Comparative Analysis (QCA) is both a technique and research approach launched in the late 1980s by Charles C. Ragin. It was designed as a bridge between quantitative and qualitative strategies making the goal of creating a new strategy that integrate the best features of qualitative and quantitative to create case oriented approach for small to intermediate cases using set relations instead of statistical measurement tools like correlation analysis (Rihoux, 2003; Ragin, 2007).

QCA is a case sensitive approach which considers the complexity of individual cases and the need to comprehend each case as an entity before creating inter case analyses (Ragin, 2005). Since most part of QCA deals with cases, in depth knowledge about how to create cases and analyze case is required (Rihoux, 2003). In addition to analyzing individual cases, QCA can be used to find patterns across many cases. QCA's assessment of cross case patterns respects the difference in the cases and their heterogeneity with regard to

their different causally relevant conditions and contexts by comparing cases as individual entities. The case analysis is performed by analyzing a number of cases individually and then from the result generalizations could be produce.

QCA is more appropriate when the number of cases available is small to intermediate size (Skoko et al., 2006). When the cases are small in number, it would be difficult to perform statistical procedure but still a case study with more than one case would be difficult for narrative comparison. QCA can capture causal conjunctions, even in small to intermediate situations, primarily because it permits the introduction of simplifying assumptions in a way that maintains a clear connection to the underlying cases (Rihoux, 2003).

QCA is helpful in assessing very complex causal relationships. QCA's strategy for resolving complex causal relations is the concept of the "multiple conjunctural causation" (Rihoux, 2003). The "multiple causal conjunctural causation" implies combination of conditions that eventually produces same outcome from different unions. As a result, depending on the context of the union, a given condition may have a different impact on the outcome. This in turn implies that different causal paths, although each path being relevant in its distinct way may lead to the same outcome (Skoko et al., 2006; Ragin, 2005). Causal relationships are more complex when there are different combinations that would result in the same outcome.

QCA has focused its statistical analysis method on set relations than correlations, which is the de facto statistical method. QCA provides relationship between conditions and outcomes in the form of necessity and sufficiency conditions. Thus, the most important causal relations; necessity condition relation, and sufficiency condition relation are indicated when certain set relations exist: With necessity, the outcome is a subset of the causal condition; with sufficiency, the causal condition is a subset of the outcome (Ragin, 2005; Rihoux, 2003). Only set theoretical methods are well suited for the analysis of causal complexity.

Generally, using QCA includes three steps (Skoko et al., 2006). The first step in using QCA for research analysis of cases is to determine which set of cases to include in the

research. The next step is to use the truth table to evaluate propositions about necessary and sufficient conditions for the case under the study. After identifying sufficient and necessary conditions, a model will be developed. In QCA, causal models could not be done by specifying a single causal model that fits the data best but instead the researcher need to determine the best causal model after a comparable study using different characteristics.

What makes QCA an attractive technique for research purpose is the different features it provide to study the case comprehensively (Rihoux, 2003). The basic feature of QCA is the summarization of data to explain the cases in a systematic way by producing tables for conditions and their outcomes. In addition to summarization, the tables could be used to check for the coherence of the data before continuing with model building. Using the table, an equation with minimal complexity would be obtained that can be used, interpreted, and compared against the cases examined leading the researcher inductively to new segments of theory or framework.

Qualitative Comparative Analysis using Fuzzy Sets

QCA is applied on cases using many mathematical techniques among which the Boolean and fuzzy logic are the de facto techniques that has been used to analyzed data in QCA and the software designed to assist data processing: fsQCA. In either technique, the focus of the analysis data is finding the sufficient or necessary conditions for the expected outcome to happen.

Boolean logic applied to QCA techniques uses the basic principles of the Boolean algebra with its' dual states that are generally referred as one, which indicates presence of a condition, and zero, which indicates absence of a condition. In addition to presence/absence representation of data, Boolean logic has two basic operations: addition and multiplication. In Boolean logic, addition is equivalent to the logical operation 'or', while multiplication is equivalent to the logical operator 'and'. This fact has been used in finding specific combination of causal conditions using multiplication or the 'and' operator and the addition operation to indicate the presence of alternative path to get to the outcome (Skoko et al., 2006).

Boolean logic used in QCA would require the collected data to be transformed into algebraic format that is achieved through transformation of attributes that are in the form of presence/absence dichotomies into their respective 1/0 format (Skoko et al., 2006). These dichotomies are then included in a truth table with each row representing a truth table set of causal and outcome conditions which are displayed using binary forms. This binary data will pass through Boolean minimization process to formulate the most efficient formula.

Whilst QCA with Boolean has worked well there is undeniable limitation with Boolean algebra and its truth table: it only works for causal conditions that are pure presence/absence dichotomies. To solve this limitation, QCA has found a well developed mathematical concept for addressing the in between members in sets that are not either present or absent: fuzzy set theory or fuzzy logic. Fuzzy sets has solved the limitations of Boolean for it allow intermediate states with values in the interval between zero (nonmembership: absence) and one (full membership: presence) (Ragin, 2007).

Fuzzy set has enabled researchers to create progressive membership scores thus permitting a partial membership against none or full membership. A membership score of 1 indicates full membership in a set; scores close to 1 (like 0.9 or 0.8) indicate high inclination to but not quite full membership in a set; scores less than 0.5 but greater than 0 (like 0.2 and 0.1) indicate that the condition is closer to the nonmembership part which is still a member while it can be considered as weak member of the set; a score of 0 indicates full nonmembership in the set (Ragin, 2007). Hence, fuzzy sets can be considered a method that can work for both qualitative and quantitative assessment. While the values 1 and 0 are quantitative representations, it also includes a fuzzy value which cannot be interpreted as either present or absent (like the value 0.5). The interpretation of quantitative is a matter of statistical interpretation the fuzzy set could be analyzed only using theoretical and substantive knowledge. The freedom of expressing a condition more than the absent and present choices has make QCA using fuzzy set more radical and profound technique to be used.

2.3. Review of Related Literature

Related literatures about ICT adoption are as diversified and broad as the type of ICTs available for every specific business area or group of people. Accordingly, the reviewed literature shows researches about ICT adoption are mostly specific to a group of user: ICT adoption among Internet users or a group of business organizations, ICT adoption of small and medium enterprises. In addition, most of the related researches focus on testing the available ICT adoption models on specific scenario. The researches selected for the review are chosen taking in to consideration the above diversification: literature about ICT adoption models and ICT in the banking industry are selected. Thus, among the wide variety of researches available under ICT adoption those researches, which have significance influence with methodology followed by the research or ICT adoption models that are taken as a ground, are reviewed as follows. In the first part, researches dealing with ICT and banking in general will be analyzed followed by researches that have identified different factors and drives that have motivated ICT adoption in different countries and circumstances would be considered. The researches selected are not exhaustive, rather they are chosen for their relevance.

ICT Adoption and the Banking Industry

Researchers in many empirical studies have confirmed how banks and their ever changing business environment have been benefited from wide varieties of technologies available: WAN and LAN networks, telephone banking, Internet banking (include services like webpage, e-home and e-office banking), automatic teller machine (ATM), smart cards, magnetic ink character reader (MICR), electronic fund transfer, electronic data interchange, computerized credit rating (Agboola, 2005; Zhu et al., 2004; Nelson, 1999; Namirembe, 2007; Durkin and Howcroft, 2003). Wide collection of researches around the globe has emphasized ICT and how it has changed the way business is conducted in the banking industry. A case study in Kampala by Namirembe (2007) has investigated the influence of ICT on banking industry specifically three major banking technologies: telephone banking, Internet banking, and electronic funds transfer. Another scholars in UK, Dunkin and Howcroft (2003), has conducted a research to find out how the Internet has changed the relational marketing area of the banks in three countries:

USA, UK, and Sweden. On the other hand, Zhu et al. (2004) has evaluated the influence of networking on the return of investment in USA banks. Zhu et al. (2002) has examined the ICT based services and its implication on customer services. Contrary to the above researches, a study from Sudan has shown the impacts of ICT in international banking systems and yet how partaking in this endeavor for developing countries like Sudan has been hindered by social, economic, and political factors. In relation with this Dagneu (2000) has shown how difficult it is for a developing country, Ethiopian in this case, to participate in the new economic order created by ICT because of different social and economic reasons.

Considering the literature available, it would be convenient to state ICT has become part of everything the banks are trying to achieve and striving to provide: productivity, improved efficiency, customer relation services, quality of service, cost effective transaction, better competitiveness, positive return on investment, and effective marketing function (Agboola, 2005; Zhu et al., 2004; Zhu et al., 2002; Nelson, 1999; Dagneu, 2000; Namirembe, 2007; Mistry, 2006; Stella, 2010). The researches that have found the effect of ICT in the banking industry with their major findings are discussed on the following paragraphs.

Durkin and Howcroft (2003) had studied the impact of ICTs, specifically the Internet, on the relational marketing strategy of banking. The research was conducted in three countries: USA, UK, and Sweden. The research has focused on the senior bankers of the three countries as a population to assess how they evaluate Internet as marketing tool using an interview questions designed in three different themes to incorporate the cultural difference. The result of the research shows wide acceptance in the role of Internet as relational marketing tool if it is compensated with rich information about customer behavior and preference to accommodate for its lack of traditional social interaction, which had been the base for marketing strategy before the Internet. The research has also emphasized the difficulty of using ICTs for marketing strategy for it requires intensive study about customer behavior, which is characterized by constant change.

On the similar area, bank marketing, a research about banks in USA was conducted by Nelson (1999) to give assurance about the importance of integrating ICT with marketing

functions to create favorable environment for ICT utilization. The research has used interview with intensive literature review to come up with the result. The result depicts the major problem concerning marketing in many banks is lack of alignment between ICT and marketing strategy. In addition, the researcher has recommended promoting cultural difference in ICT studies concerning bank marketing.

Banks and quality of service are things than should be considered in parallel. In research about the ICT based services and service quality, Zhu et al. (2002) has conducted a study in USA banks and come up with a model which explain the relationship between ICT based service and the service quality mostly using questionnaire. The result of the research has shown the value of ICT based service has a direct influence on the service quality, which includes reliability of service, responsiveness, and assurance of the service. The researcher has recommended on the implication of investing on technology for the sake of the technology: technology alone does not bring success for it has to be preceded by a study that investigate whether the technology will improve customer services or not. Therefore, the recommendation is about how ICT based service gives need to be motivated by how the customers have evaluated the ICT based service if quality of service and customer satisfaction is to be achieved from ICT.

A research that has focused on examining the role of information technology in regulating the relationship between costs and cost drivers and revenue and revenue drivers by utilizing a cost and revenue driver model had been conducted by Mistry (2006). The researcher has checked the cost /revenue and their drives and ICT's role using a secondary data focusing on part of the banking functions. The research implies contrary to many researches, which suggest the difficult of coming to conclusion about the impact of ICT from aggregated data about the exact cost, and benefit values of an ICT, the research shows the impact of ICT can be measured by separating variables that need to be assessed for the measurement. The cost of an ICT investment could be measured to produce an approximate value if the variables that are related with the cost could be dealt individually. The final output of the research was a practical model that can be used by ICT decision makers to assess the impact of ICT in banking activities using the cost and revenue driver model by disaggregating the influential ICT variable.

Stella (2010) has an empirical research on thirteen commercial banks in Nigeria to find the relationship between ICT and efficiency in the banks. The research was conducted using a questionnaire and documented sources. It was discovered that information technology improved the efficiency of such banks after its adoption and more would be achieved if changes around ICT could be facilitated. The suggested improvements are increased investment in information communication technology by banks, diversification of software packages for greater operational efficiency and strengthening of an enabling environment with respect to improved electricity supply, more favorable ICT gadgets importation policies and encouragement of local industries that are into information technology acquisition, production and assembly by the government to achieve optimal performance and greater utilization of information communication technology devices.

Another research from Nigeria by Agboola (2005) has conducted a survey research for assessing the technologies available in the banking industry using a questionnaire. In addition to the survey, the researcher has found out how technology has become the main driving force of competition in the banking industry during the period of study. Moreover, the research has show the positive impact of ICT in revenue improvement, better customer relation, improved content and quality of banking operations and the research has reported ICT has provided banks with a great opportunity for business process reengineering.

Namirembe (2007) has studied banks in Kampala to find the influence of ICT on banking, specifically telephone banking, Internet banking, and e-funds. The research was carried out as a mixture of quantitative, qualitative, correlational, and case study using questionnaire as a major research instrument. The major findings of the research were, among the three major ICTs and ICT based services studied it was revealed that telephone banking had a high predictive potential compared to e-funds transfer and Internet banking technologies. On the other hand the potential of predictive power was more when the three technologies are applied together than when each one is operating independently using the predictor variable; ATM. The prediction is about the influence of an ICT on the customers of the bank towards using the service. Generally, the researcher concludes that the predictive potential of ICTs on the banking industry in Kampala is still

low. To suffice this low predictive power of ICT in the industry, recommendation has been entailed specially for the managers of the banks; bank managers need to work hard on user awareness, implementation and monitoring and evaluation of what are implemented taking financial risks and a great commitment for the overall process.

Factors Affecting ICT Adoption in the Banking Industry

Among the available ICT adoption models, Rogers' model of diffusion innovation theory is the most tested model to determine factors behind ICT adoption (Yang et al., 2007; Eriksson et al., 2008; Kolodinsky, 2004; Olatokun and Igbinedion, 2009). Most of the researches focus on a single banking technology and its driving forces.

On a survey research in USA, Kolodinsky (2004) has used Rogers' diffusion model to find factors affecting consumers' adoption of technologies related with e-banking. The result suggests relative advantage, compatibility, and income had a significant and direct relationship with e-banking technologies. There have also been factors like age, which were visible in e-banking technologies such as phone banking and PC banking. Another factor mentioned that was believed to change the trend of adoption was privacy and security. Unless issues related with privacy and security are not resolved customers' adoption of these technologies will decline. Furthermore, customers' beliefs and habits have been identified as factors that influence e-banking technologies. The researcher has recommended increasing e-banking adoption require designing corporate as well as country level policy taking the users in to consideration is required.

Yang et al. (2006) has tested diffusion innovation model to determine the driving factors of ICT adoption by conducting a survey research in the USA. The researcher had concluded, many of management style related factors have an importance in sanctioning ICT adoption. The factors mentioned were managers' attitude toward ICT, interest in ICT, age and approach towards the change with the time required for ICT evaluation, implementation, and operation. Contrary to the above facts, the researcher has concluded organizational resources and external pressure specifically competitor companies who have adopted ICT shows little significance in the ICT adoption process.

On the other part of the world, Olatokun and Igbinedion (2009) had studied banks in Nigeria using a structured questionnaire to reveal reasons behind adopting ATMs by customers. The findings were the attitude of users towards ATMs would affect their intent to use the technologies. Furthermore, the attitudes of the users have a direct link with ATMs and their technicality, their requirement for change in lifestyle. In addition, what is known about ATMs, and whether a test has been conducted to check the consistence of ATMs in service delivery determines the attitude of users. The result suggests if the service of ATM is less technical, less demanding in change, more consistency and highly predictable it will promote better ICT adoption.

In a research conducted to examine diffusion innovation theory in Estonian banks, the researchers, Eriksson et al., (2008), had used questionnaire to study the status of banking technologies and their driving forces. The researchers have suggested the need to customize the Rogers' diffusion innovation model, since the model was designed bearing in mind only the developed world, to accommodate the economic and cultural environment in Estonia banking industry. The model uses factors in diffusion innovation theory: relative advantage, complexity, perceived risk, and compatibility. The final analysis shows that relative advantage and complexity have the strongest influence on adoption of internet banking in Estonia considering the current economic, social and ICT infrastructure.

In addition to diffusion innovation model, other ICT adoption models were used to examine factors of ICT adoption. Fink et al. (2005) have used Decomposed Theory of Planned Behavior (DTPB) to find factors that would encourage customers to opt for Internet banking in Thailand. The research's findings show different levels of influential factors that would encourage customers using Internet banking: the most significant being features of the web site the banks are using and perceived usefulness the customer expects from using the Internet banking. The other moderate factors include gender, educational level, income, Internet experience, and Internet banking experience. The major obstacle in adopting ICT had been the external environmental factors: government policy, infrastructure, and culture.

A research from Sudan conducted by Mahdi and Dawson (2007) has shown the status of ICT in the banks of Sudan and has depicted empirically how the technology is shaped and influenced by combination of contextual elements that are related to the political and social history of Sudan. The research has shown the economic factor, development of infrastructure and attitudes of top decision makers has a great impact on the adoption of ICT. Data was collected from primary sources using questionnaire and was supported by secondary data to fulfill the objective of the research, which has followed both qualitative and quantitative methods of research. The research has provided a wide range of important factors that need to be assessed for improved ICT uptake. Among these policy initiatives, infrastructure development, the social and political contexts are the major ones. Furthermore, economy of scale, skilled banking employees, lack of awareness about the technology, fear of technology, user resistance from older employees, the effect of family business, different interests of senior managers in the banks and unavailability of budget or funds for technology has profiled the use of ICT in Sudanese banks. Finally, the research has pointed a very crucial point concerning ICT researches in the developing countries.

The researcher has pinpointed that most of the researches about ICT are conducted from the point of view of countries with well developed ICT infrastructure, extensive education system, and relatively stable political and economical structure. This implies researches in developing world need to customize these researches so that it could fit the social, cultural, economical, and political arena of the region.

In addition to the above researches, Zhu et al. (2002) has determined that the ICT policy implemented has a positive influence on acceptance of ICT based services and customer evaluation of ICT based services. The research has also shown how customer evaluation of ICT based services are affected by the experience of user about ICT based services and user preference towards the traditional banking process. Agboola (2005) has pinpointed drives from two perspectives: local and global drives. While the locals were time saving, error rate reduction, management decisions and speed of transaction, the global drives were stated as better competition, modernization, improved revenue, and ICT's power of forecasting future trends. Singh and Malhotra (2007) had studied the driving forces of

ICT adoption from a perspective of the nature of the bank like its age, size, asset, number of branches, and market share. The result of the research was banks with larger size, younger age, private ownership, stable fixed assets, high deposit, and fewer branches have a high probability of adopting ICT. The research confirms banks with less market share tend to rely on adopting banking technologies. In addition, the probability of adopting banking technology has shown a direct relationship with external pressure; the adoption of banking technology by other banks

The above researches have shown the diversified nature of banking technologies and factors that have enforced users to adopt ICT in their banks. This would confirm the need to customize ICT adoption research under the consideration of the current ICTs and ICT based services, the environmental factors in which the Ethiopian banking industry is currently operating.

Chapter 3: Methodology

In this chapter, methodology, the overview of the research in terms of how the techniques and approaches that are used for the research are related with the actual research process is discussed. This includes the general research design on which the purpose and approaches of the research is discussed followed by the population of the research, the tools and techniques used to gather information, the quality assessment techniques used to check validity of the research tools, the sample selection techniques and data analysis and preparation that has been undertaken are illustrated consecutively.

3.1. Research Design

The research design is like a general plan the researcher uses to move from one state or process to the other. In the research design, the research purpose and the appropriate techniques that need to be followed to achieve the objective of the research is formulated. In addition, the approaches followed by the research and how it is implicated in the research questions would be described.

The purpose of the research, which is a combination of discovering the current state of the ICTs and ICT based services in the banking industry and determining the relationship between ICT adoption and ICT drives could be achieved by following the principles of descriptive and exploratory techniques respectively. Descriptive research is all about finding out the current state of the area of study and reporting the findings as they appear without any further analysis (Kahan, 2007). The researcher has little control on what would happen or what the results should be. Descriptive research is reported in the form of frequencies and patterns out of pure statistical results. On the other hand, the exploratory research could be used to design a certain hypothesis by analyzing the problem of the research from different aspects (Kahan, 2007; Bailey, 1978). While the descriptive techniques is used to report the type of ICT, barriers of ICT adoption and the like, the exploratory techniques is used to find a relationship between ICT adoption and ICT drives.

The major research approaches, qualitative and quantitative research are both used in this particular research. The strategy followed to incorporate both approaches is designed in a form of a case study mixed with descriptive research questions. The descriptive research questions cover the part of the quantitative aspect of the research while the case study is used as a method for the qualitative portion of the research.

Case studies are appropriate when there is a need to enquire a certain phenomena from a real life perspective. In case studies, how and why things are happening would be contextualized from the perception of the people who are involved in the case (Punch, 1998). In addition, case studies are a powerful means to understand what was assumed and what really happened by contrasting the two points to reach to a point where assumptions could be replaced by what is really happening (Roworth-Stokes, 2006; Noor, 2008). Case studies would give the individuals to have a decision making power to choose what appropriately describe their situation and hence provide their perception on what is important and what is not in concept and theory formulations like policy making (Kahan, 2007; Roworth-Stokes, 2006; Noor, 2008). When these points are viewed from the perspective of the research, it explains the need of case study in the research. The research, which is striving to recommend ideas for an ICT policy from the perspectives of the ICT professional on what is important and what is not for the development of ICT in the banking industry, could manipulate the strength of case studies to reach the goal of the research. Case studies could include a single case or multiple case scenarios. The major problem behind case studies is its lack of generalization and statistical reliability (Ragin, 2008). Auspiciously, there is a method, which will incorporate case studies with numerical analysis: QCA. QCA is used for the purpose of this research to analyze cases and understand the relationship between concepts in the form of cause and outcome conditions (See Chapter two for more about QCA).

3.2. Research Population

The research had intended to cover all currently operational banks that have an independent ICT department and head offices in Addis Ababa. At the beginning of the research there were sixteen banks among which thirteen are private: Dashen Bank, Construction and Business Bank, Awash Bank, Abysinia Bank, Wegagen Bank, United

Bank, Nib Bank, Cooperative Bank of Oromia, Lion Bank, Zemen Bank, Oromia International Bank, Buna International Bank and Berhan International Bank, and the remaining three are state owned: National Bank of Ethiopia, Commercial Bank of Ethiopia and Agricultural and Industrial Development Bank). After preliminary investigation fourteen banks has become the actual research focus: National Bank of Ethiopia does not have the required information for the research and Nib Bank has rejected the request for cooperation in the research process.

Even though the focus of the research is on banks, the research instrument or the unit of the sample was rather in terms of the ICT staffs than the banks. Consequently, the population of the research is the ICT staffs of the fourteen banks who are currently working in the head offices of each bank. The population size was difficult to comprehend because of incomplete data: some banks were not willing to disclose the information.

3.3. Sampling Technique

Sampling is important for it would be practically impossible to include the whole population in the research process. In most cases, the size of population is too many to cover within the limited time frame, which is a feature of many researches. In addition, population based research could be very expensive and unnecessary. This implies the need for selecting a sample from a population except in rare cases where the whole population, small in size preferably, could easily be studied. Different sample selection techniques could be used to assist the sample selection process.

Selecting sampling techniques that appropriately capture the objective of the research and minimize the level of bias resulting from unrepresentative samples depends on the degree of consideration given to variables that affect sample selection techniques. The success of a sampling technique in including a fair and representative sample from the sample frame depends on the characteristics of the population, the sampling unit, the data collection method, and sampling size (Kahan, 2007; Freedman, 2004; Magnani, 1997). After assessment of these factors, the researcher could select the probability or non probability sampling technique.

Probability sampling technique ensures every member in the sample frame has equal probability of being selected (Freedman, 2004; Magnani, 1997). This known equal chance of selection guarantee the minimization of bias and increase the representation power of the samples when inference is conducted to stretch the results of the sample to represent the whole population. Probability sampling is usually conducted by following a simple systematic procedure, which begins with identifying a sample frame from the population, and this will requires knowledge about the exact number of the sample frame (Kahan, 2007). After this, preparing a list might facilitate the selection procedure in addition to creating a favorable environment for equal chance selection. Random, stratified, and cluster sampling are varieties of probability sampling (Bailey, 1978; Punch, 1998).

Non probability sampling works without any systematic way of selecting a sample. Unlike probability sampling, knowing the exact size of population or making sure every member has equal chance is not practiced. In non probability sampling, the researcher's subjective judgment will determine the output of the selection process (Freedman, 2004; Magnani, 1997). Non probability sampling is best used when leaving the selection process for equal chance could not deliver a representative sample. The involvement of the researcher is important in the process to ensure the eminent and representative members are selected. Convenience, purposive (judgment), quota, and snowball sampling techniques are some of the major non probability sampling techniques (Bailey, 1978; Punch, 1998). Among these, judgment or purposive sampling will allow the researcher to choose the samples based on a personal judgment supported by knowledge about the sample frame and information about the purpose or objective of the research (Bailey, 1978).

A thorough analysis of the different techniques available and their appropriateness and constraints on the data collection process against the research and its objectives was used to come up with the right technique of selecting a sample. Judgment sampling was selected for it was the right fit and the freedom the researcher could exercise on sample selection was the right way to select a sample in this particular research.

Hence, the first process in the data collection process was to assess the hierarchy of the ICT department in each bank. The information about the hierarchy of the staff arrangement was used to select ICT staffs who participate in the research. This rule was not applied to ICT managers since all ICT department managers were selected to participate in the research without any further inquiry. If a bank has a vertical, top down departmental structure, ICT staffs that are the head of divisional units in the hierarchy were selected. In case of flat departmental structure, seniority was used as criteria of selection. The researcher believed including respondents from different ICT division would diversify and complete the information collected. Moreover, the seniority of the staff will increase the staff's involvement in decision making and partaking in different strategic positions which intern would provide better response for the research. Generally, the sample selection method was designed to insure a diversified ICT staff is included in the research process.

3.4. Data Collection Method and Tool

Data collection method should be in accordance with the design of the research. For the purpose of the research, a questionnaire and interview were designed to gather required information that could answer the questions of the research from the ICT staff of the banks.

The designed questionnaire and the interview questions have been analyzed from the perspective of their acceptability by the banks. After performing a preliminary investigation in sample banks, the probability of collecting information using the interview was insignificant to support the need of the research. The reasons were mainly time constraints that are imposed by the interviewing process, which has repulsed most of ICT mangers from participating in the research. On the other hand, when the issue of data security was considered most of the participants in the research believed questionnaire is less threatening than interview. Hence, two questionnaires were designed to incorporate the interview questions planned for the ICT managers.

The first questionnaire designed for managers have twenty questions (see Appendix A). The questionnaire was designed by formulating questions, which will directly answer the

objectives of the research. The questions could be grouped in to general overview about ICT unit in the bank, the available ICTs in the bank, ICT and its implication in the bank and enterprise ICT policy issues. In the general overview part, questions that could gather information concerning the availability of computer and Internet, the value of ICT in the bank and the investment precaution concerning ICT are included. ICT and its implication have been viewed from perspectives of barriers of ICT development, influences of ICT in the banking activities and the different drives that contribute for ICT adoption. ICT policy issues have been considered from the point of view of general industry level ICT policy and enterprise level ICT policy. Respondents were asked to express their perception concerning the current ICT policy objectives of the financial sector. In addition, information about enterprise level ICT policy of each bank has been explored.

The questionnaire designed for the ICT staff has ten questions and all the questions are included in the questionnaire designed for the ICT managers. The major difference between the two questionnaires is additional questions included in the questionnaire designed for the ICT managers', which were questions more fit to the manager: questions like enterprise ICT policy and investment decisions about ICT.

The nature of the research, which requires an exhaustive listing of information, might create a problem for respondents and hence will affect the quality of information collected. On reflection of this idea, the questions were designed in a form of selecting from a list, which has reduced the burden of writing down answers. There has been a great effort to incorporate every kind of response a participant might prefer to select but if there are also other options, free space was provided where the respondent can write what he/she thinks or prefers other than the listed options. The questionnaire has proved to be easy to use and understand. Generally, a total number of eighty copies of the questionnaires, which fourteen were ICT manger's questionnaire and sixty six were ICT staff questionnaires, were distributed. Among the eighty administrated questionnaires, sixty four or 80% were returned.

3.5. Quality of the Research Tool

The quality of the research tools will inevitably determines the quality of information collected. In cases where the research instrument or the data collection tool is a questionnaire its' quality could be measured in terms of validity and reliability of the questions. Furthermore, the quality measurement could be seen from two faces: the quality of the questions and the quality of the data collected.

Validity is basically about the soundness of the data collected in terms of making sure the data collected is really what was intended to be gathered (Kahan, 2007; Bailey, 1978; Punch, 1998). The data should be dependable for all the inferences to be made from it. Among other things, designing complementary questions and sources could assist in securing validity. Moreover, analyzing each question in terms of its' content in the questionnaire designing time could provide a better ground to get valid information. Measures have been taken to insure the validity of the questions for this research. Due to the time constraint, testing the questionnaire was not feasible instead, each questions were carefully designed from a research questions that has been already answered. In addition, the questionnaire from European Federation of Information Technology in different industries has been thoroughly analyzed to create a reliable background for the designing process of the questionnaire.

On the other hand, reliability of the questionnaire focuses mostly on the consistency of the research questions. Consistency could be in terms of the consistency of the data collected through time. Reliability could be affected from intentional wrong response, respondents' error, or unintentional simple wording error (Kahan, 2007; Bailey, 1978; Punch, 1998). What should be done to indemnify the reliability of the research comes from an intensive research review and diversifying the sources of clues and ideas for the questionnaire. In case of the research under contemplation, each question was checked from perspective of at least two researches. In addition, to identify respondent's error easily, some questions were repeated purposely as a checking method.

3.6. Data Processing and Analysis

Data processing is an important process, which will determine the outcomes of the research depending on how well the data collected was processed to check for invalid, and inconsistency information. Accordingly, questionnaires with inconsistent information and with important questions unanswered have been eliminated from the research.

The type of data analysis method to be used will depend on the type of the research approach. In descriptive research, data would be prepared to form mainly of summary statistics. If the need of the research is finding a relation or an association between two groups, a correlation coefficient is the major analysis tool. For the research purpose while summary statistics has been used to prepare the data for quantitative interpretation, instead of correlation coefficient, a set relation has been used which is the de facto analysis method of QCA.

One part of data preparation step, which is the most important of this research, is developing cases. Creating a multiple cases mainly depends on the researcher's knowledge about the background of the cases using the information collected and literature review. Taking this in to consideration the researcher has developed a three level case based on the ICTs and ICT based services the banks are using currently. Furthermore, as an alternative a case of fourteen is created using each bank as a single case. The need for creating different cases was to incorporate the difference of ICT related drives that arise from the level and usage of ICT in the banks.

The collected data is prepared for presentation and report using two different techniques to comprehend the quantitative and qualitative nature of the research. In one part SPSS and Microsoft Excel has been used to produce descriptive analysis in a form of statistical summarization and comparisons. The other part is about building a model that best describe the driving forces of ICT adoption using fsQCA. In this part, the data collected is first prepared in accordance with the required format of fsQCA using Microsoft Excel, followed by importing the prepared data from the Microsoft Excel file to fsQCA for model building and case analysis.

Chapter 4: Data Analysis

In data analysis, the collected data need to be analyzed in a manner where interpretations could be done and information could be retrieved from it. This is where the objectives of the research come to be resolved and achieved. Basically, data analysis is the gear of the research to reach to its goal and achieve what has been promised all along. In this part of the data analysis, reports about the current situation of ICT in the banking industry are illustrated using verbal descriptions supported with graphical presentations. The report includes the respondents' background in terms of their position in the bank, a general background of ICT departments, ICTs and ICT based services of the banking industry, barriers and influence of ICT adoption and issues concerning enterprise ICT policy. The many available features of SPSS and Microsoft Excel are used for the analysis purpose.

4.1. Respondents' Background

The respondents of the research are diversified professionals with different role and responsibility. The respondents' background is discussed from the perspective of job title and position of the ICT staffs.

The ICT managers of the banks are given different titles in different banks. The given position or title of the manager depends mostly on the organizational structure of the bank and the position of the ICT department in the structure. The banks use different job title for the head of the ICT manager. Among these, nine banks have ICT managers with a title of 'IT Manager', two banks use 'Vice President of IT', two more banks use 'Director of IT', and one bank has a manager with a title of 'Head of IT Service'.

The other staffs of the department have different job titles in accordance with the divisions of ICT department the staffs are currently working. Most of the respondents have a job title of 'Network Administrator (Engineer)', 'System Administrator', 'Database Administrator', 'System Developer', 'System Analyst', and 'Programmer'. In addition, 'Team Leader', 'ICT Infrastructure Head', and 'Software Support Supervisor' are common job titles among the respondents. Some rare job titles that are in the domain

were ‘IT Officer’, ‘Application and Database Manager’, ‘Security Specialist’, and ‘Program Analyst’. As it was in the plan to include diversified ICT professionals in the respondents’ domain, the job titles stated above could justify the attainability of the plan.

4.2. General Review of ICT Departments

The importance of ICT in the industry could not be apparent than by looking at the attention given to creating an independent ICT unit in most of the banks. All of the fourteen banks that are studied have an independent ICT unit. However, the name of the unit differs from bank to bank; it is a variety of either IT department or ICT department. For convenience purpose, the term ‘ICT department’ is used in this thesis to describe whatever the banks are calling to convey the unit responsible for ICT related activities and services in the bank. The review made about the ICT department include, the distribution of ICTs and ICT services in the bank, the computer and Internet availability to the ICT staff, the value of ICT in the bank and investment decisions made by the ICT department on the ICT related gadgets.

The type of ICTs that are implemented in many banks could be a proof of how the business has become very demanding concerning ICT for better competition and survival. Many of the advertisement of the banks broadcasted constitute mainly the name of the ICT based services the banks are providing: ICT has the power of changing the image of the organization. From this perspective, the level of ICT distribution in the branches of the banks could illuminate how many of the banks are investing on ICT to use its value added feature. While using ICT for image enhancement is part of the many benefits of adopting ICT, the major benefit is using ICT to change the day to day transaction of the bank. The results of this question has shown, about 57% the banks have implemented ICT in all of their branches. The rest of the banks have implemented ICT in 96%, 95%, 87%, 75%, and 63% of their branches. From the result, it can be conclude most of the banks are inclined in using ICT to change their business process.

Table 4.1: Distribution of ICTs in branch offices of the banks

Number of banks	Percentage of ICT distribution
8	100%
1	96%
1	87%
1	75%
1	63%
2	6%

Assessing the availability of compulsory resources in the department of ICT in the banks is one way of understanding the value given to the department and its' staff. To evaluate the banks' value to the ICT department, questions addressing the two major ICT resources: computer and Internet have been inquired. The result shows, practically every ICT staff in the bank has a computer. In case of the Internet, all banks have an Internet connection but the access of Internet by all ICT staffs have returned a positive in twelve branches, a negative in one branch and partiality in two branches. The partiality in the two branches is, while the ICT managers claim all ICT staff has Internet connection the ICT staffs have disagreed. The type of Internet connection was 50% broadband and the other 50% uses both broadband and dial-up Internet connection.

Banks could implement ICT just to follow strategic plan or even worse following a trend set by competitors. Though both of the above reasons have no problem per se, ICT by its nature is dynamic and the environment and the functionalities of the ICT to be implemented usually trigger adoption of ICT. Investing on ICT will require a thorough analysis on the direct values of ICT. The ICT staffs in the banks are professionally fit to assess the worth of ICT in terms of its' value to the bank. In response to a question whether ICTs and ICT based services implemented are mandatory for the existence and proper functioning of the banking activities, the result shows most of the ICT staff agreeing to the importance of the ICTs implemented for the banks to function properly.

The outcome shows, 71% of the respondents agree about the importance of each ICT currently adopted in the banks, 21% has agreed with some doubts and 8% has disagreed on the importance of the ICTs implemented in the banks.

The other review done from departmental level was evaluation of investment trends on measuring ICT in terms of monetary value. Measuring ICT from a perspective of money is always a very difficult task because of the nature of ICT. The monetary values of ICT could not be calculated from its current values. Most of the benefits are long term and some of them could not be measured at all in numbers. All this could contribute for lack of monetary measurement in ICT investment by the banks, which might result in unexpected losses from ICT investments. The results of the question concerning the investment of ICT and its monetary measurement shows, 28% of the banks practicing monetary measurement, 42% of the banks are not measuring ICT in terms of monetary values, while the remaining 30% have not considered this issue as valuable investment decision practice. The banks, which are not practicing monetary measurement in ICT investment, have supplemented it using different benefit measuring techniques. These banks, instead of monetary value, have used customer related benefits like customer satisfaction, customer need assessment, improved customer service, business process improvement, and dynamism of service delivery as measurements of value before investing on ICT.

4.3. ICTs and ICT Based Services of the Banking Industry

The role of ICT ranges from changing individual lives to controlling the pace and path of the world economy. One of the reasons for this emancipated coverage is the availability of ICT for almost every business and social activity. ICTs and ICT based services can be produced to serve a general purpose that cross industries and business activities. On the other hand customized ICTs and its' services are what really make ICT the essence of every business organization. The banking industry, even the Ethiopian banking industry is no different. Through the years, many of the banks in Ethiopia have adopted many general purpose and ICTs specially designed for the banking industry. The value of ICT is increasing through times in the industry; the fact that almost all of the new banks have

ICT based services equivalent with, and in some cases better than the giants of the industry is the evidence.

Considering the fact about the young age of ICT in the banking industry the question designed to gather information about the survey of available ICTs was in a form of selection of different ICTs and ICT based services that are gathered from different reviewed literatures. The survey was in the form of assessing the current ICTs and ICTs to be implemented in the near future with a time frame of two years.

The survey includes ICTs ranging from a simple stand alone computer to a sophisticated system like computerized credit rating systems (See Appendix A for full list of the ICTs and ICT based services). The result of the survey as shown in Table 4.2 depicts diversified ICTs and ICT based services found in the industry. The major technologies currently adopted include Stand alone computer, Internet access and wire based LAN, which are implemented throughout the banks. Following these, special banking software systems in 79.6%, WAN networks in 71.4%, and ICT security systems in 64.3% of the banks are implemented. While electronic fund transfer and webpage services are implemented in half of the banks, electronic data exchange covers 42.9% of the banks. In addition, open source operating system and staff and customer authentication systems with 35.7%, e-signatures services and ATM with 28.6%, wireless LAN, extranet and CRM with 21.4%, telephone banking, ABP, business to government transaction and customer interaction via the Internet with 14.3% and e-home banking, e-office banking, smart cards, computerized credit rating and business to business transaction with 7.1% are results of the survey concerning the current ICT in the banking industry. From the given list, magnetic check reader and e-invoice services were not implemented in any of the banks.

Many of the banks have a plan to adopt almost all of the ICTs listed, which are not currently implemented in their bank. Accordingly, the ICTs and ICT based services with the percentage of the banks which have planed to invest in near future are; customer interaction via the Internet (71.4%), ATM and computerized credit rating (64.3%), telephone banking, e-home banking and magnetic check reader (57.1%), electronic fund transfer (50%), extranet, webpage services, e-office banking, e-invoice services, smart

cards, CRM and business to business transaction (42.9%), electronic data exchange, ABP and ICT security systems (35.7%), WAN networks, wireless LAN and business to government transaction (28.6%), e-signatures services, open source operating system and staff and customer authentication systems (21.4%) and banking software systems(14.3%).

Table 4.2: Currently implemented and future implementations of ICTs

Currently implemented	Future implementation	Number of banks	
		Frequency	Percentage
Stand alone computer, Internet access, wire based LAN		14	100%
Banking software systems		11	78.6%
WAN networks	Customer interaction via the Internet	10	71.4%
ICT security systems	ATM, computerized credit rating	9	64.3%
	Telephone banking, E-home banking, magnetic check reader	8	57.1%
Electronic fund transfer, webpage services	Electronic fund transfer	7	50%
Electronic data exchange	Extranet, webpage services, e-office banking, e-invoice services, smart cards, CRM, business to business transaction	6	42.9%
Open source operating system, staff and customer authentication systems	Electronic data exchange, ABP, ICT security systems	5	35.7%
E-signatures services, ATM	WAN networks, wireless LAN, business to government transaction	4	28.6%
Wireless LAN, extranet, CRM	E-signatures services, open source operating system, staff and customer authentication systems	3	21.4%
Telephone banking, ABP, business to government transaction, customer interaction via the Internet	Banking software systems	2	14.3%
E-home banking, e-office banking, smart cards, computerized credit rating, business to business transaction		1	7.1%

While collecting data about the available ICTs and ICT based services, related information about staff awareness on future plans of adopting ICT has been gathered. The results of data collected from different banks on adopting ICTs in the near future shows different levels of awareness among the staff. The result is displayed in the following Figure 4.1 in a form of percentage. The result shows there is significant amount of awareness among the staff about ICT related plans.

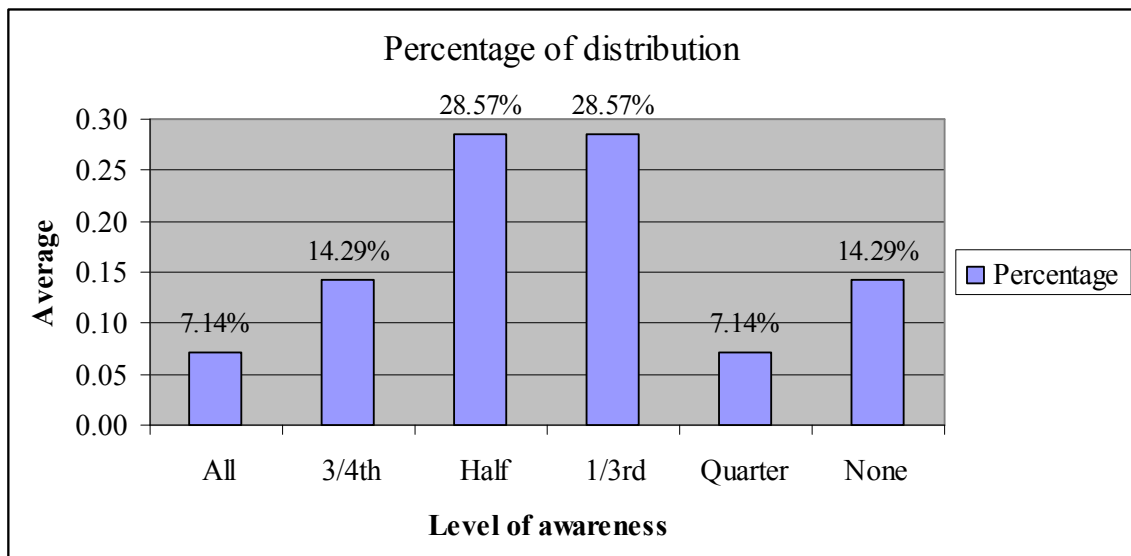


Figure 4.1: Staff awareness about future ICT related plans

4.4. Driving Forces of ICT Adoption

The major objective of the research is finding the relationship between the ICT drives and ICT adoption using different group of factors. In this chapter, these factors are summarized to provide descriptive information about the drives of ICT adoption in Ethiopian banking industry. The relationship between ICT adoption and ICT drives in a form of cause and outcome is identified in the next chapter along with model building. For this purpose, twenty nine factors in seven groups were identified from the literature. The groups are corporate strategies, innovation (technical) dynamics, management capacity, task level issues, organizational factors, economic factors, and environmental

factors. In each group, there are related sub factors and the respondent is required to select the level of each factor in scale of high, medium, and low. The general frequency of these factors is shown in the Table 4.3. For summery purpose respondents who have undecided ideas are grouped under ‘Don’t know’ column.

Table 4.3: Frequency distribution of driving factors of ICT

ICT Drives	Levels			Don't know
	High	Medium	Low	
Improved and quality service delivery	46	15	2	1
Expand the market geographically	41	15	7	1
Improved market performance	44	16	2	2
Company image considerations	48	15	1	0
Size (number of branch or customer)	29	28	6	1
Centralized business management	40	19	5	0
Task specialization	24	34	5	1
Top management support	33	21	10	0
Low service charge	16	30	8	10
Increased efficiency and effectiveness	40	18	2	4
Increased savings	32	20	7	5
Reduced business costs	28	23	9	4
Manager's innovativeness	25	27	9	3
Manager's ICT awareness	29	25	9	1
Customer pressure	36	20	4	4
Business trend	40	19	0	5
Business partners' pressure	31	20	5	8
Competitive pressure	43	17	2	2
Availability of ICT infrastructure	9	41	9	5
Supportive economic policy	9	40	11	4
Government's support and initiative	9	34	15	6
Ease of use	34	23	4	3
Quality of IS systems and capabilities	34	22	6	2
Compatibility	29	30	3	2
Autonomy	16	29	5	14
Speed up business processes	40	17	4	3
Extend beyond normal business hours	30	17	12	5
Launch new services	35	18	8	3
Link internal and external business processes	28	22	10	4

To find the most influential drives of ICT adoption, factors were analyzed in each level: high, medium, and low. In accordance with this, factors with highest frequency from each level are summarized as follows.

- The highest ranking ICT drives in the level high were improved and quality service delivery, expand the market geographically, improved market performance, company image considerations, size, centralized business management, top management support, increased efficiency and effectiveness, increased savings and manager's ICT awareness in this order.
- The top factors that have excelled in the medium level drives are size, task specialization, top management support, low service charge, reduced business cost, manager's innovativeness, availability of ICT infrastructure, supportive economic policy and government's support and initiative.
- Top management support, low service charge, reduced business costs, manager's innovativeness, availability of ICT infrastructure, supportive economic policy, government's support and initiative, extend beyond normal business hours, launch new services and link internal and external business processes constitute the highest factors in low level drives.
- Factors which are labeled under 'Don't know' were low service charge, increased efficiency and effectiveness, increased savings, reduced business costs and customer pressure

After assessing a general comparison between factors in general using the level of drives as heading, each factor are compared against other factors in the same group; in this case, the grouping is based on the content of the factors as it was specified previously. Factors under the seven groupings are analyzed individually: the seven groups being corporate strategies, innovation (technical) dynamics, management capacity, task level issues, organizational factors, economic factors, and environmental factors. The first group assessed was the factors found under corporate strategy. The results are shown in Table 4.4.

Table 4.4: ICT adoption drives under corporate strategies

ICT Drives	Levels of Drives			Don't know
	High	Medium	Low	
Improved and quality service delivery	71.9%	23.4%	3.1%	1.6%
Expand the market geographically	64.1%	23.4%	10.9%	1.6%
Improved market performance	68.8%	25%	3.1%	3.1%
Company image considerations	75%	23.4%	1.6%	0%

Using the above table, a comparison was made between factors under the same group for the rest of the group. The same procedure is repeated with the other factors. The results of factors under organization, economic, management, environmental, technical dynamics and task related are shown in Table 4.5, Table 4.6, Table 4.7, Table 4.8, Table 4.9 and Table 4.10, respectively.

Table 4.5: ICT adoption drives under organizational factors

ICT Drives	Levels of Drives			Don't know
	High	Medium	Low	
Size (number of branch or customer)	45.3%	43.8%	9.4%	1.6%
Centralized business management	62.5%	29.7%	7.8%	0%
Task specialization	37.5%	53.1%	7.8%	1.6%
Top management support	51.6%	32.8%	15.6%	0%

Table 4.6: ICT adoption drives under economic factors

ICT Drives	Levels of Drives			Don't know
	High	Medium	Low	
Low service charge	25%	46.9%	12.5%	15.6%
Increased efficiency and effectiveness	62.5%	28.1%	3.1%	6.3%
Increased savings	50%	31.3%	10.9%	7.8%
Reduced business costs	43.8%	35.9%	14.1%	6.3%

Table 4.7: ICT adoption drives under management capacity

ICT Drives	Levels of Drives			Don't know
	High	Medium	Low	
Manager's innovativeness	39.1%	42.2%	14.1%	4.7%
Manager's ICT awareness	45.3%	39.1%	14.1%	1.6%

Table 4.8: ICT adoption drives under environmental factors

ICT Drives	Levels of Drives			Don't know
	High	Medium	Low	
Customer pressure	56.3%	31.3%	6.3%	6.3%
Business trend	62.5%	29.7%	0%	7.8%
Business partners' pressure	48.4%	31.3%	7.8%	12.5%
Competitive pressure	67.2%	26.6%	3.1%	3.1%
Availability of ICT infrastructure	14.1%	64.1%	14.1%	7.8%
Supportive economic policy	14.1%	62.5%	17.2%	6.3%
Government's support and initiative	14.1%	53.1%	23.4%	9.4%

Table 4.9: ICT adoption drives under innovation or technical dynamics

ICT Drives	Levels of Drives			Don't know
	High	Medium	Low	
Ease of use	53.1%	35.9%	6.3%	4.7%
Quality of IS systems and capabilities	53.1%	34.4%	9.4%	3.1%
Compatibility	45.3%	46.9%	4.7%	3.1%

Table 4.10: ICT adoption drives under task level factors

ICT Drives	Levels of Drives			Don't know
	High	Medium	Low	
Autonomy	25%	45.3%	7.8%	21.9%
Speed up business processes	62.5%	26.6%	6.3%	4.7%
Extend beyond normal business hours	46.9%	26.6%	18.8%	7.8%
Launch new services	54.7%	28.1%	12.5%	4.7%
Link internal and external business processes	43.8%	34.4%	15.6%	6.3%

After assessing the factors in their group, the last data summarization was creating a comparison between the seven groups of ICT adoption drives. To accomplish this, averages of each group from each level was calculated. The result as displayed Figure 4.2 shows corporate strategies and organizational factors as the highest driving factors in the high level drives. Environmental factors and management capacity are the leading medium level drives while management capacity and task level factors are leading the low level drives.

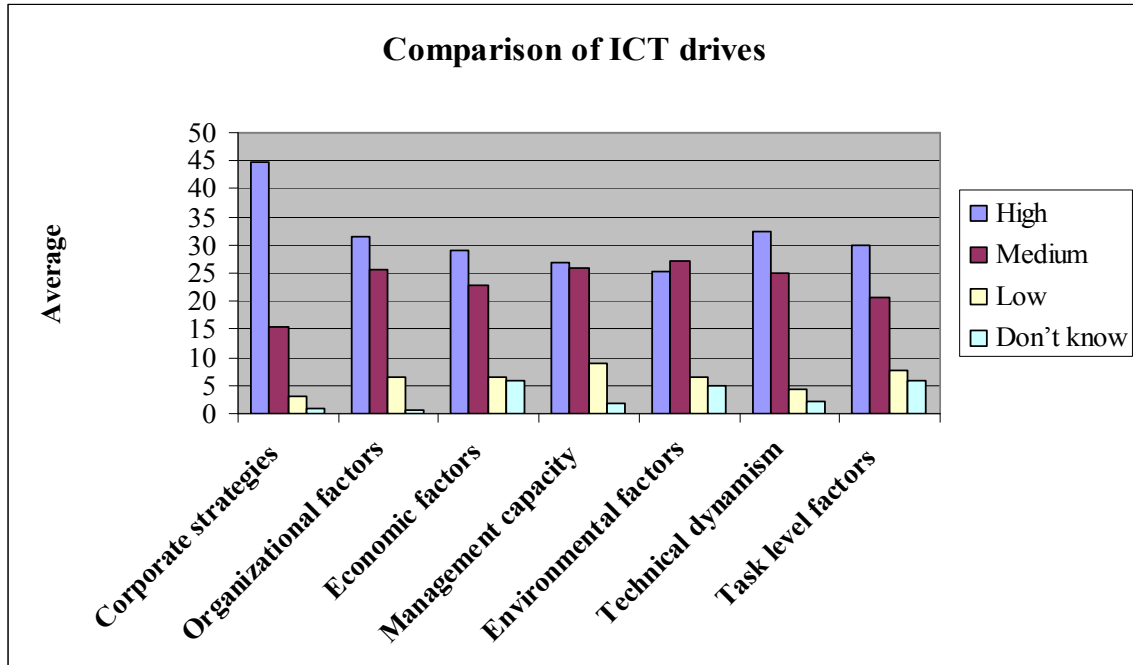


Figure 4.2: Comparison between drives of ICT adoption

4.5. Major Influences of ICT on the Banking Industry

The influence of ICT in the banking industry or in any other industry for that matter is advocated as a ground breaking means of winning the competition and changing the organization structure to make it fit for the intensive global demand. In some cases, the influences are rather copied from other enterprises, foreign and domestic, or related literatures that has proved the tangible influences of ICT with a specific situation and industry. One of the many objectives of the research was finding the influences of ICT in a contextualized situation from the actual people who could notice the influence and the changes that are brought since the adoption of ICTs and ICT based services in the bank. In addition to finding the influences of ICT, knowing the perception of the value of the influence, positive or negative, by the ICT staff was considered to be of an importance. The tendency of taking the influence of ICT as a positive and supportive for business process in all factors related with quality, staff development, or economic issues was put to test to verify if it holds true. The questions were designed to accommodate the above hypothesis. A respondent could choose the type of influence a factor has on the overall banking activities from the list provided. The choices of the influence were positive, negative and no influence. At the time of data collection, one additional choice was added by respondents' request, which represent undecided position, coded as 'Don't know'. The results are presented in Table 4.11. For simplicity purpose the factors are given a code for further analysis.

Code 1: Growth of revenue

Code 2: Reduction of operational cost

Code 3: Efficiency of business processes

Code 4: Internal work of the bank

Code 5: Quality of customer service

Code 6: Quality of services

Code 7: Productivity of employees

Code 8: Motivation of staff

Code 9: Staff development and training

Code 10: Competitive advantage

Code11: Enhance consumer and competitors' image of the bank

Code12: Flexibility/ adaptability of business activities

Code13: Ease of organizational structuring and restructuring

Table 4.11: Influence of ICT in different business factors

Factors	Positive influence		Negative influence		No influence		Don't know	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Code 1	55	85.9%	1	1.6%	3	4.7%	5	7.8%
Code 2	49	76.6%	10	15.6%	3	4.7%	2	3.1%
Code 3	62	96.9%	0	0%	2	3.1%	0	0%
Code 4	57	89%	2	3.1%	3	4.7%	2	3.1%
Code 5	60	93.8%	2	3.1%	1	1.6%	1	1.6%
Code 6	59	92.2%	3	4.7%	1	1.6%	1	1.6%
Code 7	59	92.2%	0	0%	5	7.8%	0	0%
Code 8	56	87.5%	2	3.1%	4	6.3%	2	3.1%
Code 9	57	89.1%	2	3.1%	4	6.3%	1	1.6%
Code 10	58	90.6%	1	1.6%	2	3.1%	3	4.7%
Code 11	61	95.3%	3	4.7%	0	0%	0	0%
Code 12	60	93.8%	4	6.3%	0	0%	0	0%
Code 13	53	82.8%	4	6.3%	7	10.9%	0	0%

Generally, what could be gathered from the result in the above table is the fact that most of the factors have a positive influence. On the other hand, while some of the factors have insignificant amount of numbers in the negative and no influence choices, some factors show unexpected turn in these groups. Among these, reduction of operational cost, flexibility/ adaptability of business activities and ease of organizational structuring and restructuring show a significant amount of response in the negative influence group. In addition, factors with no influence are ease of organizational structuring and restructuring, motivation of staff, staff development, and productivity of employees. From the result, we could conclude the influence ICT depends on the actual circumstance the banks are operating currently and it differs from one situation to the other.

After analyzing each factors based on their perceived influence, the major factors in the two major influences are compared against each other. The result about the major factors

in each influence is summarized as follows. Accordingly, the major factors in positive influence are efficiency of business process, enhancing consumer and competitors' image of the bank, flexibility/ adaptability of business activities, quality of customer service, and quality of services in their order of influence. Figure 4.3 shows these factors with their frequency level.

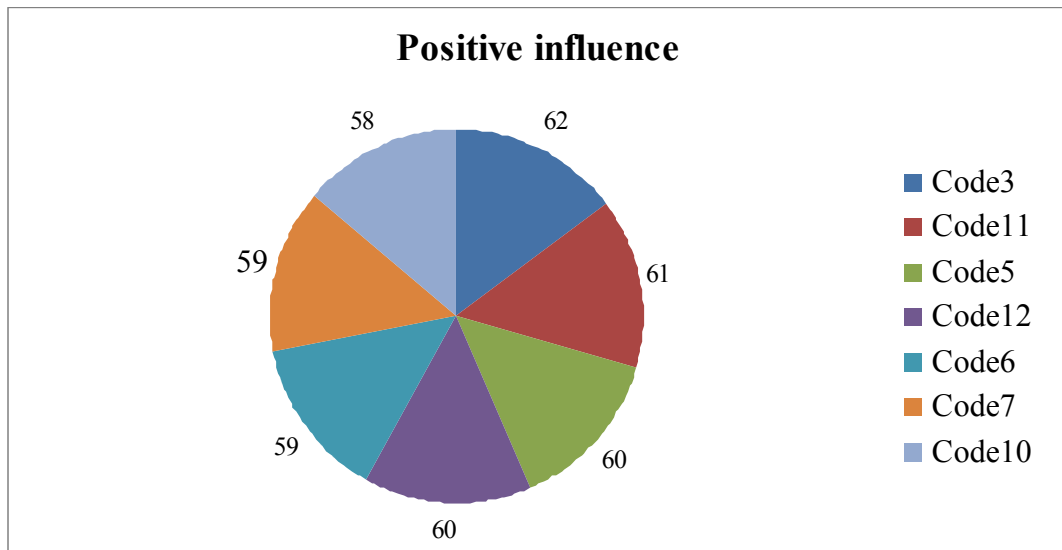


Figure 4.3: Factors with highest values of positive influence

On the same ground of comparing factors with each other, some factors show more negative influence than others do. The major factors under the negative influence are reduction of operational cost, flexibility/ adaptability of business activities, ease of organizational structuring and restructuring, quality of services and enhance consumer and competitors' image of the bank according to result. The result is summarized in Figure 4.4.

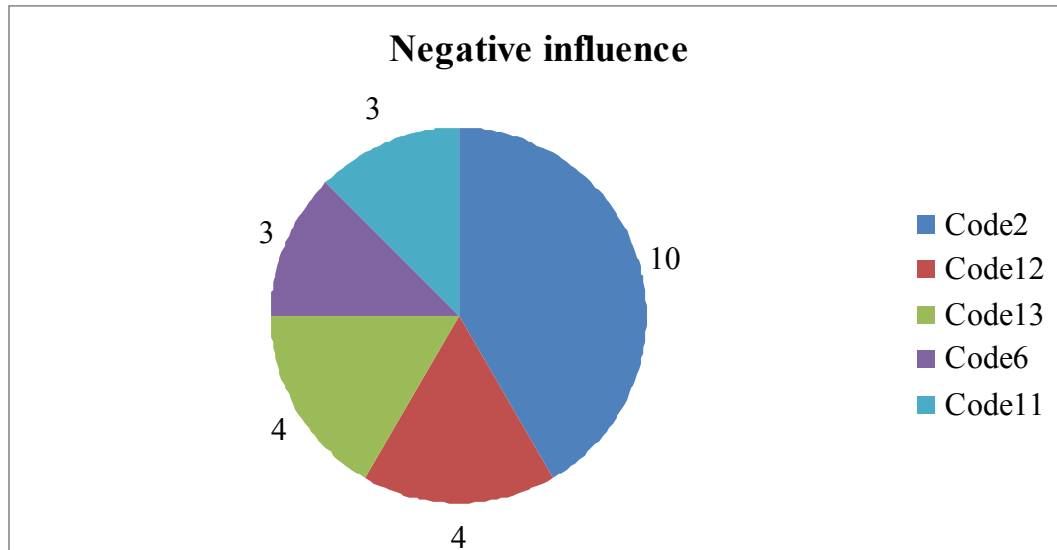


Figure 4.4: Factors with highest values of negative influence

4.6. Barriers of ICT Adoption

Factors that could be affecting the development and adoption of ICT in the banking industry are as diversified as the issues related with ICT. The research was designed in such a way that respondents could choose from the listed ICT development barriers and if there are any additional factors, the respondents could write them down on the space provided. The lists are organized under major division factors. The list begins by stating barriers that are related with the nature of the organization like lack of perceived economic or other benefits to the bank and the infeasibility of size of the bank for ICT investment. Barriers that sprang out from the technology and know how of ICT include fear of technology, reluctance of personnel to use ICT, inability of employees to use ICT, lack of preparation by customers to use ICT and the complexity of ICTs. Supplier related factors were stated which include difficulty of finding reliable ICT supplier and the unbalance between the ICT demand and supply. Issues that are related with the cost of ICT that could have hindered ICT development were stated as limited ICT expenditure, expensive hardware, and software, high update rate of the technology. The difficulty of finding qualified staff recruiting and the cost of keeping skillful professional were

another barrier that could be grouped under human resource issues. The last division of the impediments in ICT adoption was environmental factors like taxes, ICT related legal issues, security of the Internet, the infrastructure of ICT, ICT policy and government incentives. The results of the existing barriers that have hindered the development of ICT in the banking industry are shown in Table 4.12.

Table 4.12: Barriers of ICT adoption in the banking industry

ICT barriers	Frequency	Percentage
Lack of perceived economic or other benefits to the bank	20	31.3%
The size of the bank is not feasible for ICT investment	6	9.4%
Fear of technology	23	35.9%
Reluctance of personnel to use ICT	25	39.1%
Inability of employees to use ICT	15	23.4%
Customers are not prepared to use ICT based services	10	15.6%
ICTs are too complicated	5	7.8%
It is difficult to find reliable ICT suppliers	25	39.1%
The supply of ICT is not matching the ICT needs of the bank	16	25%
ICT expenditures are limited	21	32.8%
Expensive hardware	31	48.4%
New versions of existing software introduced too often	6	9.4%
Expensive software	30	46.9%
Difficult to recruit qualified ICT personnel	20	31.3%
Qualified personnel are expensive	14	21.9%
Taxes are too high on hardware and software	15	23.4%
Unreliable legal ground for ICT investment	12	18.8%
Lack of security and privacy on the Internet	24	37.5%
Lack of ICT infrastructure	42	65.6%
Lack of government incentive	24	37.5%
Inadequate ICT policy	22	34.4%
VAT on ICTs is high	16	25%

Assessing the above results show the majority of ICT adoption barriers belong to the environmental and cost related factors. Lack of ICT infrastructure leads the group with 65.6% followed by cost of hardware and cost of software that account for 48.4% and

46.9% respectively. Filtering out the top fourteen factors based on their frequency, five out of seven environmental factors were in the top list. Following this, three out of four economic factors are part of the major ICT development barriers.

The major statistical finding shows, factors which are hindering the development of ICT in the banking industry, are mostly cost related and external factors like the level of infrastructure, the adequacy of the ICT policy, the availability of legal ground, and taxes and VAT on ICTs.

In addition to the above factors, respondents have also write down different causes of the problems related with ICT adoption rate and utilization. The majority of the suggestions were top management commitment concerns. Among these, lack of ownership of ICT by the management body, poor business requirement definition by decision makers and planners, the amount of time it takes for management to accept ICT requests, lack of management support and incentives for ICT staff and the ICT unit were the major ones. Cost related issues were supported by additional factors like the expense of banking software and their rate of update, which has become a problem in many banks and constrained them form the competition in the industry. Furthermore, high payment for leased line of the Internet service has also been mentioned. The absence of well organized internal structure, lack of capacity to invest on human resource, hardware, and software required for proper functioning of the ICT unit, skilled staff turnover, lack of interest in the business staff for new ICTs, and fear of change that is usually associated with ICT were some of organizational factors stated. In addition, environmental factors such as lack of awareness by the public about ICT based services, the banks dependability on only one third party, ETC, for any type of infrastructural support and lack if Internet connection in most part of the remote areas where the branches of the banks are found were identified as major causes hindering ICT adoption. The other factor hypothesizes as a cause of ICT development problem was lack of coordination in the financial sector as an industry.

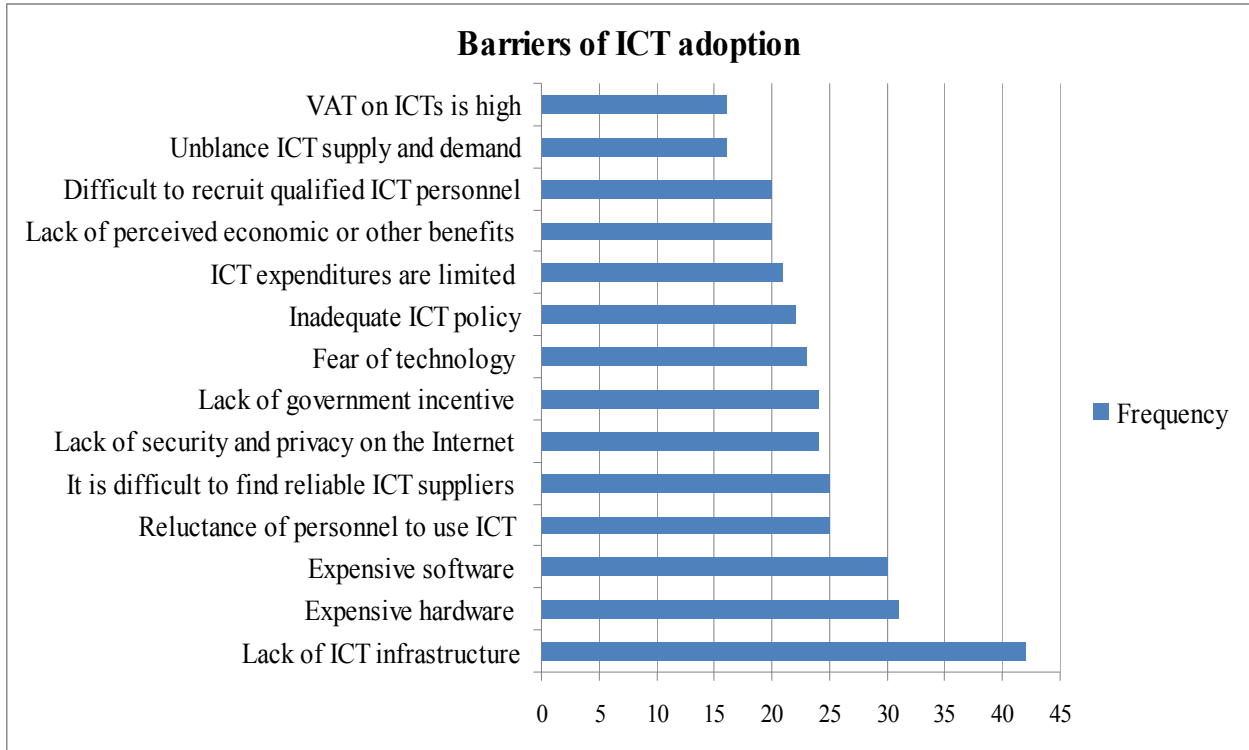


Figure 4.5: The major ICT adoption barriers

4.7. ICT Policy

The ICT policy of the country is a broad concept, which includes ICT policies for all industries, different objectives based on the need of the industries, and strategies designed to achieve the objective. Every organization in a given industry should be familiar with the ICT policies directed at it to create an enterprise level ICT policy that rhythm with the national ICT policy. The research’s focus concerning ICT policy was to find out the level of knowledge about the current ICT policy by the ICT staff of the banks and preview enterprise level ICT policies if there are any. The sample national ICT policy objectives are reviewed by the ICT staff concerning the level of their attainment. Additional objectives and strategies that should be added to the national ICT policy about the financial sector are also inquired.

Review of Industry Level ICT policy

The document prepared as an ICT policy guideline does not directly provide ICT policy statements for the banking industry. By going through the ICT policy document, scraps of ideas that have a relation with the financial and the banking industry were collected. The researcher would like to assure that the ICT policy objectives selected to be reviewed by the respondents were not exhaustive. The major objective of the sample policy review is measuring the knowledge of ICT professionals concerning the available ICT policy and measuring the objectives stated against the reality of the banking business in which the objectives should have been tested and implemented. The sample policy objectives to be discussed are coded for simplicity purpose as follows.

- Code1: Modernize the banking system to facilitate the development of e-commerce and trade.
- Code2: Upgrade and expand communications and Internet delivery infrastructure.
- Code3: Enact laws and regulations that promote and facilitate electronic cash payment systems to promote the development of e-commerce.
- Code4: Make the Internet a secure environment for local, regional and global e-commerce to ensure effective consumer protection and confidence in doing business online.

The above four ICT objectives are found under the strategic focus of the ICT policy division in the heading of e-commerce. The next two objectives stated below are in the division of the strategic focus of the ICT policy under the heading of ICT system security and standards.

- Code5: Take appropriate measures to ensure that ICT will be used in all sectors based on international interoperable standards.
- Code6: Establish standards for interconnectivity and interoperability of computer networks.

Table 4.13: Perception of ICT staff on ICT policy objectives

Policy objectives	Attained		Progressive		Failed		Don't know	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Code1	1	1.6%	46	71.9%	3	4.7%	14	21.9%
Code2	1	1.6%	51	79.7%	3	4.7%	9	14.1%
Code3	2	3.1%	38	59.4%	3	4.7%	21	32.8%
Code4	1	1.6%	29	45.3%	6	9.4%	28	43.8%
Code5	1	1.6%	29	45.3%	6	9.4%	28	43.8%
Code6	3	4.7%	34	53.1%	4	6.3%	23	35.9%

As it can be comprehended from the above table most of the respondents' perception inclines on ICT policy objectives being on progressive stage. Surprisingly, the number of respondents' who have no idea about the ICT policy objectives and their stage of accomplishment were significant. On average, number of respondents who think the ICT policy objectives are in progressive stage are 59.1%, and the people who have answered 'Don't know' were 32%. Respondents with a perception ICT policy objectives have failed are 7% and respondents who think the objectives are attained are 2% (See Figure 4.6 for more information.)

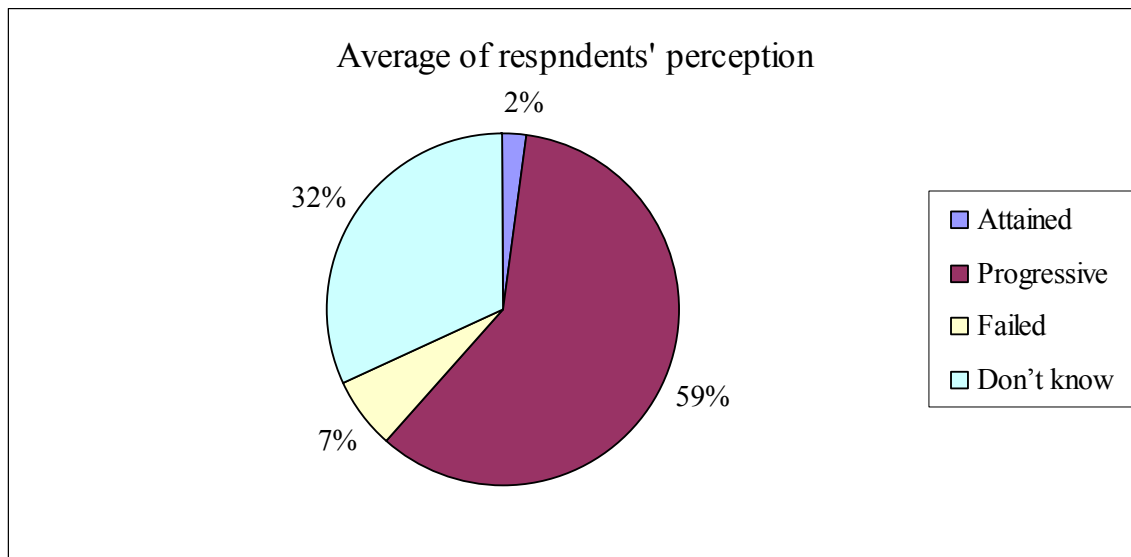


Figure 4.6: Perception of ICT staff on the level of ICT policy attainment

The above assessment was done from all the respondents of the research. In the questionnaire designed specifically for the managers, additional questions concerning the ICT policy were included. The questions are about the adequacy of the ICT policy objectives for sustainable ICT development and any recommendation the managers have for improvement of ICT policy in the financial sector.

The adequacy of the current ICT policy objectives was evaluated by the ICT managers and of which nine of them (64%) has stated it is inadequate, three of them (21%) has stated it is adequate and the rest has taken the neither stand. The group of respondents who agreed on the insufficiency of the current policy has suggested recommendations that should be included in the policy.

- A policy that would minimize tax should be created for the banking industry. The justification given for this idea was that the current tax on ICT does not create a favorable environment for the development of the banking industry and the development of banking industry would have contributed a great deal investment opportunity that would pave the way for the countries development in general.
- The involvement of government with software and hardware vendors to control the price of goods would solve the problem of over pricing and elevate the current cost of ICTs and ICT based services. A policy that would bind the vendors with some legal ground should be formed.
- Rather than developing a very general intangible ICT objectives a specific and detail ICT policy statements is desired.
- Cyber law has to be established if all the opportunities created by the Internet should be put in to practice to produce a desired outcome in the development of ICT in the industry and the country.
- A policy that would facilitate and coordinate state banks to share resources with private owned banks should be developed to assist the newcomers to the industry: state banks have better ICT infrastructure assets than other banks.

- Private telecom companies are badly needed. If the pace of ICT adoption continues with the current rate, the ISP of the country, ETC, would not suffice the need of ICT infrastructural services. The predicament will be either to privatize some part of the telecom and infrastructure or lose the investment value that could have been gained from utilization of ICTs in the banking industry.

Enterprise Level ICT Policy

The enterprise level ICT policy is used to guide ICT related decisions in each bank. The policy would guarantee a better ICT resource management, better ICT plans that are aligned with the plan of the organization and a secured ICT environment among other things. Usually the enterprise level policies are customized from the industry and country level policies to accommodate the specific need of the organization while keeping the major policy issues consistent with the industry and country level issues.

In case of the Ethiopian banking industry, though the industry level ICT policy is not yet established, ten out of fourteen banks (71%) have an ICT policy. The objectives or strategies of the policies are quite similar in most cases as stated as follows.

Objectives

- Control the growth and cost of ICT in the bank to align it with the banks goal and objective.
- Create strategies that could make possible a secured environment for ICT investment and usage.
- Develop ICT risk and control management plan.
- Utilize ICT to create business continuity plan.
- Motivate and train the banks' employee to use ICT.
- Protect fraudulent activities using the many features of ICT.
- Attain better ICT resource management.

- Establish a clear policy objective that deal with ICT development, access, and governance.
- Design a resilient, fast, and better internal process by incorporating ICT in the banking activities.
- Provide better customer service provision.
- Realize the banks vision and goal through ICT.

Strategies

- Acquire up-to-date banking software packages.
- Develop organizational culture on building software that can accommodate the exact need of the bank.
- Prepare documents that could be used for training of staff on ICTs and ICT based services, specially banking software.
- Minimize the paper work by replacing monotonous works with ICT.
- Create a knowledge sharing environment between employees of the bank and with other banks.
- Practice outsourcing and off shoring for better cost minimization and task specialization.
- Establish an environment, which has a better infrastructure, policy, regulation, and education about ICT to use the global opportunity and enhance international interaction.

Chapter 5: ICT Adoption Model using fsQCA

The most important prospect of any research is the result drawn from the collected data. There are many means to accomplish this quest according to the type of the research. Statistics has been the ally of data analysis with its incredibly diversified tools and techniques to find any pattern possible. The previous chapter has used some of the basic tools of statistics to illustrate the results of this study. On the other hand, the major objective of this research, developing ICT adoption model, needs something other than statistics for the value of numbers in statistical summarizations has little to do with the process of model building. The appropriate technique for the research, which is a combination of quantitative, qualitative, and a case study with the specified objectives of the research is QCA. In this chapter, banks will be ranked based on the ICTs and ICT based services implemented. In addition, ICT adoption model will be built using the basic procedures of fsQCA.

5.1. Profiling Banks Based on Level of ICT Adoption

Leveling the banks based on the ICTs and ICT based services was very difficult. For one thing, there is little local literature on the progressive stages of ICT adoption in the banking industry. In addition, there is lack of standard for leveling ICT users based on their advancement in ICT. Since profiling the banks was an important step for building the ICT adoption model, the collected data about the ICTs of each bank was assessed with a support of subjective perception to create the level of ICT adoption in the banking industry.

While leveling each bank according to their level of ICT adoption, two things were considered important. One of them was the available technologies in each bank, whereas the other is the distribution and availability of the ICT in other banks, which is represented in percentage. The distribution represented in percentage is used to create the value of an ICT based on its' frequency: an ICT found in all banks will fall under the 100% level. To suffice the second criteria, a level of distribution with a progressive value

(see Table 5.1) based on the coverage of the ICT across the banks was created: the less the value of distribution, the more the value of the level would be.

Table 5.1: Level of distribution of ICTs

ICT coverage in percentage	100	86	64	50	43	36	29	21	14	7
Level or value of distribution	1	2	3	4	5	6	7	8	9	10

After creating the level of distribution, the next procedure was to find the frequency of each ICT and ICT based service for all the banks based on the level created in Table 5.1. This is accomplished using the collected data about each bank and their available ICT. For example, if the level under 64 has three ICTs and a bank has implemented two of these ICTs, its frequency under 64 will be two over three. This way, the frequency of all the banks under each level was calculated. Banks are given codes for privacy purpose, each bank starting from A to N.

The frequency of ICT in each bank was multiplied by the value of the distribution to signify the frequency of ICTs: ICTs in different distribution level should have different value. As it can be noticed the rare ICTs have more value than the basic ICT which can be found almost in all the banks. This will give the banks which have invested in rare but important (the importance was checked manually) ICTs a plus in the leveling process. Sample results are shown in Table 5.2.

Table 5.2: Frequency distribution of ICTs

	ICT coverage in percentage									
Bank code	100	86	64	50	43	36	29	21	14	7
A	1	2	3	2	0	0	3.5	2.4	6.75	0
B	1	2	1.5	2	5	3	0	2.4	0	0
C	1	2	3	4	5	3	3.5	5.36	0	0
.
.
N	1	2	3	4	2.5	3	3.5	2.4	9	8

The final process was adding the values of each level for all the banks, which is used as a final value for grouping banks in accordance with the implemented ICT. In addition to the above procedure, the distribution of ICT in the branch offices was used a subjective measurement for leveling the banks. Conveniently, the subjective assessment was supportive of the frequency based leveling. The result of the leveling process is displayed in Table 5.3.

Table 5.3: ICT adoption level of each bank

Level	Bank code	ICT adoption value
5	A	20
7	B	16
3	C	26
2	D	34
14	E	1
9	F	11
10	G	10
12	H	4
8	I	16
6	J	19
11	K	5
13	L	3
4	M	22
1	N	38

At this point, the banks are leveled one to fourteen according to the value of ICT adoption that has been summarized from the frequency. Whilst assessing the value of ICT adoption in each bank, most banks have values closely attached for the banks to differ in level. This shows the infeasibility of ordering the banks as shown in Table 5.3. Instead, a three level structure was created to group the banks based on their value. The levels were high (value > 20), intermediate (value >= 10) and the rest was grouped under low level. Four banks were under the group of high level and the intermediate level has six banks with four banks in the low level ICT adoption. The group of banks according to these strata is illustrated in Table 5.4.

Table 5.4: ICT based level of banks in the industry

ICT adoption level	Value range	Banks
High	>20	C, D, M,N
Intermediate	10<=value<=20	A, B, F, G, I, J
Low	<10	E, H, K, L

5.2. ICT Adoption Models

Building the ICT adoption models was conducted by following the important steps of the fsQCA. These steps are organized as input, processes, and output.

Input: The Prerequisites

The rudiments for building ICT adoption models is the knowledge about the techniques used to build the models, the data to be prepared and the assumptions that have to be made based on the knowledge of the researcher about each case which is part of the deal in case study using QCA.

Qualitative Comparative Analysis (QCA) with fuzzy set has its' own systematic instruction to come to the expected outcome of the research. The instructions were designed with the assumption the user knows about set relations, fuzzy set and its' operations. Fuzzy set is a kind of set relationship or membership analysis with a membership value ranging from zero to one unlike crisp set analysis, which has either zero or one as a value. Fuzzy set has mathematical operations which include 'negation', 'logical or', and 'logical and'. In fuzzy set, the result of a 'logical and' operation between two sets is the smallest value of the two while the 'logical or' returns the largest value. Negation operation in fuzzy set transforms values from one to zero and zero to one. The product of negation of a set with value 0.6 is 0.4 which is (1- 0.6).

- A or B= the largest value of the two
- A and B= the smallest value of the two
- $\sim A = 1-A$

The data preparation was one of the most interesting and contemplated part of the model building process. Three important features need to be attended: designing cases, identifying the outcome condition and selecting the salient causal conditions.

In designing cases, two approaches could be followed for this particular research. One is taking each bank as an individual case. The other is using the output of leveling the banks to create cases for each level. When we consider each one in turn, creating cases for each bank will produce fourteen cases. This procedure will keep the difference of each bank, which makes the cases diversified while keeping the required homogeneity: all cases are part of the banking industry. The probable con of this process is the existence of similarities between banks that has to be treated individually. On the other hand, creating cases using the ICT based leveling of the banks will produce three cases. The major problem with this strategy is lack of any supporting standard or literature for the validity of the level. While creating the levels, many important features of each bank will be fused and their values lost in process. At the end, the fourteen cases developed from each bank were selected for the process.

Having the cases, what follows is identifying the causal and outcome condition(s). Understanding the objective of the research is very important in identifying the conditions. The answer to what is it that the research is trying to find out is the input to the identification and selection processes of the conditions. Since, the major objective of this research was developing ICT adoption model from the perspective of what is motivating the banks to adopt ICT, we can extract the fact that the outcome is ICT adoption while the causes are the drives of ICT adoption. Information concerning the level of impact each drive has on ICT adoption was gathered from the ICT staff of the banks (see question twelve at Appendix A). There are seven major drives with a three level; high, medium and low, which expresses the level of impact the drives have on ICT adoption. For each drive the value of the three levels were calculated using averaging as a measurement.

For example: corporate strategy: high (.64), medium (.21) and low (.15), these values shows the respondents in a certain bank who believe corporate strategy motivates ICT adoption with high level are 64%, intermediate motivation 21% and the respondents who

believe it has low motivation are 15%. After calculating the value of the drives in all the banks, the value for the level high was chosen as a value of the drive in a particular bank. The justification for this is the value of level high is the exact value of the intensity or the closeness of the drive to influence ICT adoption in the bank. The result of this process is shown in Table 5.5.

For convenience purpose and as a requirement for fsQCA software simple names for each drive was formulated as representatives of the causal and outcome conditions.

ICT adoption.....	Ictadopt
Corporate strategies.....	Cor
Organizational factors.....	Org
Economic factors.....	Eco
Management capacity.....	Mgr
Environmental factors.....	Env
Innovation/ technical dynamics.....	Tech
Task level factors.....	Tsk

Table 5.5: Values of the outcome and causal conditions

Bank code	ictadopt	cor	org	eco	mgr	env	tech	tsk
A	20.65	0.75	0.75	0.25	0	0.29	0.33	0.4
B	16.9	0.38	0.13	0.24	0	0.29	0	0.1
C	26.86	0.7	0.6	0.9	0.7	0.6	0.93	0.68
D	34.65	0.88	0.75	0.75	0.25	0.43	0.83	0.6
G	10	0.75	0.75	0.37	0	0.57	0.33	0.5
H	4.5	0.83	0.63	0.33	0.25	0.45	0.56	0.33
I	16.4	0.88	0.63	0.31	0.38	0.18	0.92	0.9
J	19.5	0.83	0.67	0.83	0.83	0.33	0.33	0.73
K	5	0.17	0.25	0.25	0	0.29	0.22	0.07
L	3	0.92	0.42	0.67	0.67	0.48	0.78	0.6
M	22.9	0.64	0.6	0.46	0.29	0.53	0.42	0.57
N	38.4	1	0.75	0.92	1	0.48	0.44	0.87

Process: Model Building

Building model using QCA begins with taking the above table of values as an input. The above value is a range, which designates the percentile value of each condition. In the column of 'ictadopt', the value of ICT adoption level that was calculated in the profiling of the banks is used. Each value against the other values show the extent the bank is advanced or lagged in ICT development. The points are not measured in terms of ICT materials but rather are ranges in a straight line measurement. The values of the drive are the extent of the ICT adoption impacted by the drive: where zero means no impact, one shows full impact and in between value show the level of impact directly proportional to the value.

Calibrating Fuzzy Sets

The first important process in fsQCA is calibrating the above value to fuzzy set membership value. Calibrating is a process of standardizing the values into the standard fuzzy set membership set. In QCA, there are two ways of calibration, direct and indirect method, for this research purpose direct method is used. The software does this process automatically but the steps will be illustrated for enlightening the user (see Appendix B for sample fsQCA user interfaces).

In fuzzy set membership, values of membership could constitute a group of

- Four value fuzzy sets (0, .33, .67, 1)
- Six value fuzzy sets (0, .2, .4, .6, .8, 1)
- Continuous fuzzy sets (any value ≥ 0 and ≤ 1)

In the four and six value fuzzy set membership the researcher will assign values based on the interval values in each condition. In the continuous fuzzy set, membership values are calculated after somehow extended procedures. The calculation is based on a mathematical translation of fuzzy set membership in verbal labels found in page 88 of Redesigning social inquiry by Charles C. Ragin (see Table 5.6).

Table 5.6: Mathematical translation of verbal levels

Verbal label	Degree of membership	Associated odds¹	Logs odds of full membership²
Full membership	0.993	148.41	5
Threshold of full membership	0.953	20.09	3
Mostly in	0.881	7.39	2
More in than out	0.622	1.65	0.5
Crossover point	0.5	1	0
More out than in	0.378	0.61	-0.5
Mostly out	0.119	0.14	-2
Threshold of full nonmembership	0.047	0.05	-3
Full nonmembership	0.007	0.01	-3

The starting point of set calibration, that is after having the above table, is to select three qualitative anchors of each condition: the threshold for full membership, the threshold for full nonmembership and the cross over point. Let us take the values of ‘ictadopt’, the outcome condition, to demonstrate the calibration process.

The first thing to be done is choosing the three anchors which makes the final result of the calculation less of a mathematical rescaling and more of the result from the imposition of the external factor like the researchers’ judgment. The values are chosen after studying the cases where value of each threshold is interpreted. In accordance, the threshold for full membership will be a number, which represent values that can be a full membership of the condition, the threshold for full nonmembership will be a number, which represent values that cannot belong to the membership of the condition and the crossover point represent values that are in the middle of the membership scale. For the demonstration purpose, seventeen is chosen as the threshold for full membership, two for the threshold for full nonmembership and seven for crossover point of the outcome condition.

¹ Associated odds = (Degree of membership)/ (1- Degree of membership)

² Logs odds of full membership = natural log of Associated odds

Table 5.7: Process of calibrating degree of membership using direct method

Bank code	ictadopt	Deviations from crossover	Scalars	Product	Degree of membership (mictadopt)
A	20.65	3.65	0.18	0.64	0.97
B	16.9	-0.1	0.18	-0.02	0.91
C	26.86	9.86	0.18	1.74	1
D	34.65	17.65	0.18	3.11	1
E	1	-16	-1.5	24	0.02
F	11	-6	0.18	-1.06	0.65
G	10	-7	0.18	-1.24	0.57
H	4.5	-12.5	-1.5	18.75	0.1
I	16.4	-0.6	0.18	-0.11	0.9
J	19.5	2.5	0.18	0.44	0.96
K	5	-12	-1.5	18	0.12
L	3	-14	-1.5	21	0.05
M	22.9	5.9	0.18	1.04	0.98
N	38.4	21.4	0.18	3.78	1

Deviations from crossover = ‘ictadopt’ – crossover point

Scalars are calculated based on the following principle:

$$\left\{ \begin{array}{l} \text{If value of 'ictadopt' > crossover point} = (\text{threshold for full membership} / \\ \text{Log of odds for threshold of full membership})^3 \\ \text{If value of 'ictadopt' < crossover point} = (\text{threshold for full nonmembership} / \\ \text{Log of odds for threshold of full nonmembership}) \end{array} \right.$$

Product = Deviations from crossover * Scalars

Degree of membership= exponential of natural log of product/ (1+ exponential of natural log of product)

³ See table 5.6 , the value log of threshold for full membership is 3 and for full nonmembership is -3

The above procedure might seem an inhospitable mathematical jargon, which is true to some extent. Fortunately, fsQCA software accomplishes the above procedure with a simple command. The simple requirement is to specify the three qualitative measurements for each condition and the software will display the calibrated membership value. Accordingly, after trying many threshold values for each condition the following output is chosen for its representatives of the original data.

Table 5.8: Fuzzy set calibrated membership value for cause and outcome conditions

Bank code	mictadopt	mcor	morg	meco	mmgr	menv	mttech	mtsk
A	0.97	0.9	0.98	0.01	0	0.16	0.11	0.35
B	0.91	0.1	0	0.01	0	0.16	0	0.01
C	1	0.82	0.82	0.98	0.9	1	1	0.88
D	1	0.99	0.98	0.93	0.1	0.71	0.99	0.78
E	0.02	0.74	0.02	0.79	0.68	0.43	0.11	0.19
F	0.65	0.74	0.07	0.88	0.88	0.04	0.6	0.54
G	0.57	0.9	0.98	0.29	0	0.99	0.11	0.61
H	0.1	0.97	0.88	0.11	0.1	0.82	0.83	0.19
I	0.9	0.99	0.88	0.06	0.43	0.04	0.99	0.98
J	0.96	0.97	0.93	0.96	0.96	0.26	0.11	0.92
K	0.12	0.01	0.02	0.01	0	0.16	0	0.01
L	0.05	0.99	0.23	0.88	0.88	0.92	0.98	0.78
M	0.98	0.65	0.82	0.61	0.16	0.98	0.55	0.74
N	1	1	0.98	0.98	0.99	0.92	0.6	0.97

The command accepts the original value stated in Table 5.5, the crossover point, the threshold value for full membership, and the threshold value for full nonmembership. The command has a formula, which accepts the specified four values and new variable name to store the results. The output of the formula for each condition, cause and outcome, are stored in the new variable name⁴.

⁴ The variable in table 5.5 are all changed by adding “m” in front of it to accommodate the change in content of the variable which is the membership value of each condition in each bank.

Truth Table Algorithm

Truth table is the major tool of fsQCA for data analysis, data minimization, and finally identifying the sufficient and necessary conditions of the outcome. Truth table in QCA with crisp set is a straightforward procedure since the values of the conditions are already zeros and ones. For fuzzy set, though it is not the only way to the solution but the optimum, resilience to the process of complex steps to reach the truth table is important. Again, this step is complicated only if it is done manually since it is just one click away using the fsQCA. After explaining the major processes behind the scene in truth table algorithm, creating the table using the data prepared in the above section will be illustrated.

Fundamentally, the truth table starts with ‘logical and’ operation between all possible combinations of the causal conditions and their negations. The combination is 2^k , where k is the number of the causal conditions. If a case has two variables, A and B , the possible combination are AB , $A\sim B$, $\sim AB$, $\sim A\sim B$. This combination usually known as the corners of vector space will result in a new value for each combination using the principle of ‘logical and’ operation: the smallest value of the conditions combined is assigned as the new value. According to the truth table algorithm, combinations with value less than 0.5 are not persuasive enough and should be discarded: the combinations with less than 0.5 are called remainders. The remaining combination is represented in a truth table for further analysis.

The truth table result for a case study with seven conditions is one hundred and twenty eight rows, which is the case of this research. To simplify the process two pairs of conditions were merged using the ‘logical or’ operation supported by one of the features of fsQCA. The pair were cooperate strategies and organizational factors, and innovative or technical dynamics and task level. This result in a truth table with thirty two rows, which means five conditions. After removing the combinations with less than 0.5 value, the following truth table, Table 5.9, is created to show a relationship between the outcome condition, ICT adoption (‘mictadopt’), against the causal conditions: economic factors (‘meco’), managerial capacity (mmgr), environmental factors (‘menv’), the combination of task level and technical issues (‘comtkts’) and the combination created form the cooperate strategy and organizational factors (‘cororg’).

Table 5.9: Results of the truth table algorithm

meco	mmgr	menv	comtkts	cororg	Number	mictadopt	Consist	Pre	Product
1	1	0	1	1	2	1	0.90	0.85	0.76
1	0	1	1	1	2	1	0.89	0.85	0.76
0	0	0	1	1	1	1	0.83	0.76	0.63
0	0	0	0	1	1	1	0.81	0.71	0.58
1	1	1	1	1	3	0	0.72	0.69	0.49
0	0	1	1	1	2	0	0.60	0.43	0.26
0	0	0	0	0	2	0	0.58	0.46	0.26
1	1	0	0	1	1	0	0.56	0.19	0.11

The software will generate all columns except the one labeled with ‘mictadopt’. The column under ‘number’ shows the number of acceptable cases in this corner of the vector space or the combinations of the conditions with value >0.5 as per the standard specified. The last three columns: ‘consist’, ‘pre’, and ‘product’ are all measurements of the same thing, which is consistency of the causes with the outcome. The ‘mictadopt’ column is filled manually using the values stated in the consist column. According to the standard threshold, consistency value of less than 0.75 is believed to be not significant member of the outcome. To show this, the outcome of cases with value more than 0.75 for consistency are assigned the value of one and the rest are assigned zero.

Consistency and Coverage: Sufficient and Necessary Conditions

Consistency shows the degree of each combination’s attachment with the outcome or in set relations language the degree to which the causal conditions are subsets of the outcome. For a given case when all values of the causal condition are subset of or greater than the values of the outcome there exists a relationship known as sufficiency. Sufficiency means the causal condition is sufficient to trigger the outcome. On the other hand, consistency can also be used to identify necessary condition for the outcome to happen. Necessity is the direct inverse of sufficiency: when all values of the outcome are subsets or greater than the values of the causal conditions, this specific causal condition, or combination of causal conditions are necessary for the outcome. A perfect necessity and sufficiency, all cases satisfying the rule of necessity and sufficiency, are

difficult to be attained and depends on the number of case: the larger the case the more perfect the necessity and sufficiency would become.

In QCA or in case studies in general, reaching to the outcome could take many alternative paths. The degree in which the causal condition (s) covers a given path to the outcome is coverage. When there are many paths to reach to the outcome, each path will constitute combinations of different causes. The amount of coverage for a given causal combination gauges the relevance of the cause to the outcome. Coverage with consistency will be used to select a path or causal combination that has more importance than any other combination.

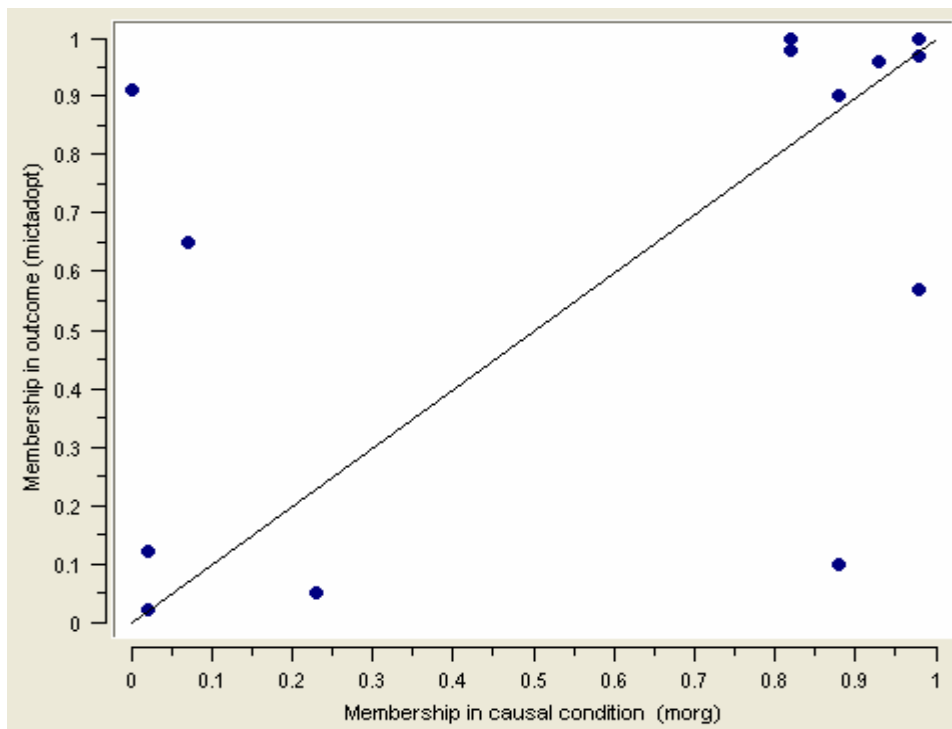


Figure 5.1: Fuzzy subset relation, consistent with sufficiency

For the purpose of demonstration, the above graph shows consistency for measuring sufficiency conditions and among the available causal conditions, organizational factors was found sufficient causal conditions for ICT adoption.

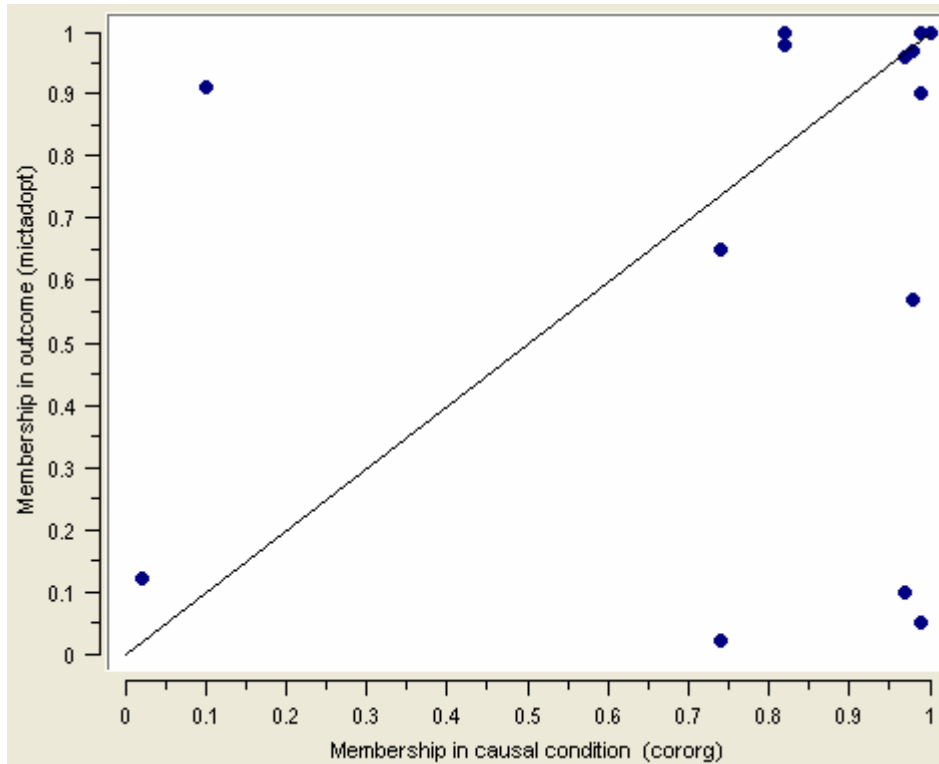


Figure 5.2: Fuzzy subset relation, consistent with necessity

The combination of factors under cooperative strategy and organizational factors were found a necessary condition for ICT adoption. It should be noted that the results shown in both Figure 5.1 and Figure 5.2 does not show a perfect sufficiency and necessity condition.

Building ICT Adoption Models

After this, the final stage of the process is building the actual models which are in a form of a set relationship, causal conditions combined with ‘logical or’, ‘logical and’ and ‘negation’ operations. The formulas are generated by the software with the researchers’ control over the selection of causal conditions and other measurements.

Table 5.8 is the direct input for the system to produce alternative formulas, which has the combination of relevant causal conditions: in this case, the combination of factors that are drives of ICT adoption. For a given setting fsQCA produces three alternative models based on their convolution. The first one is the complex solution: the complex solution tries to find the causal

relationship with the outcome from the perspective of selected cases merged with the remainders. The next solution is the parsimonious solution, the compact solution with the simplest formula. Finally, the chosen one is the intermediate solution, which is extracted by analyzing the two extremes: the complex and parsimonious solution.

Result: ICT Adoption Models

The models created by the software include the three solutions; choosing one that is more representative is done by the consistency and coverage analysis. After examining six models, the one with better coverage and consistency is chosen.

Each solution constitutes information about the following important features shown in Figure 5.3:

- Solution consistence: these measures the compound effect of the solution set against the outcome using the membership value. The result of the combination of each solutions consistency value using ‘logical or’ operator is the value of membership for the solution set. Solution consistency then measures the degree to which this value is less than the value of the outcome. If the value of the solution set is greater than the value of the outcome, it will result in inconsistency.
- Solution coverage: measures the proportion of memberships in the outcome that is elucidated by the complete set of solution in the given situation.
- Raw coverage: raw coverage is the proportion of the membership in the outcome explained by the individual solution in the solution set.
- Unique coverage: unique coverage is like the raw coverage, the difference is while the raw coverage can be shared by other solution terms, unique coverage is the proportion of membership in the outcome explained solely by the individual solution is measured.

While the assessments of these measurements are an additional feature for model comparison, still the best solution according to the algorithm in fsQCA is the intermediate solution. The other two are merely there for the analysis of the intermediate solution. Based on the intermediate solution generated, three different combinations of causal conditions are found to be the drives of ICT adoption on the banking industry of Ethiopia. The relationship between the causal

conditions and the outcome is the present or absence of the causal condition when measured using sufficient. The solutions could be interpreted as the causal conditions having a sufficiency relation with the outcome condition. In case of this research, the causal conditions stated in each solution are the drives of ICT adoption (the outcome condition).

--- COMPLEX SOLUTION ---

frequency cutoff: 1.000000
consistency cutoff: 0.812950

	raw coverage	unique coverage	consistency
~meco*~mmgr*~menv*cororg	0.213434	0.156013	0.867841
meco*mmgr*~menv*comtkts*cororg	0.191766	0.135428	0.898477
meco*~mmgr*menv*comtkts*cororg	0.221018	0.171181	0.890830
solution coverage:	0.523294		
solution consistency:	0.934236		

--- PARSIMONIOUS SOLUTION ---

frequency cutoff: 1.000000
consistency cutoff: 0.812950

	raw coverage	unique coverage	consistency
meco*~mmgr	0.252438	0.114843	0.859779
~menv*comtkts	0.344529	0.225352	0.903409
~meco*~comtkts*cororg	0.190683	0.054171	0.871287
solution coverage:	0.569881		
solution consistency:	0.911612		

--- INTERMEDIATE SOLUTION ---

frequency cutoff: 1.000000
consistency cutoff: 0.812950

Assumptions:

	raw coverage	unique coverage	consistency
cororg*~menv*~mmgr*~meco	0.213434	0.156013	0.867841
cororg*comtkts*menv*~mmgr*meco	0.221018	0.171181	0.890830
cororg*comtkts*~menv*mmgr*meco	0.191766	0.135428	0.898477
solution coverage:	0.523294		
solution consistency:	0.934236		

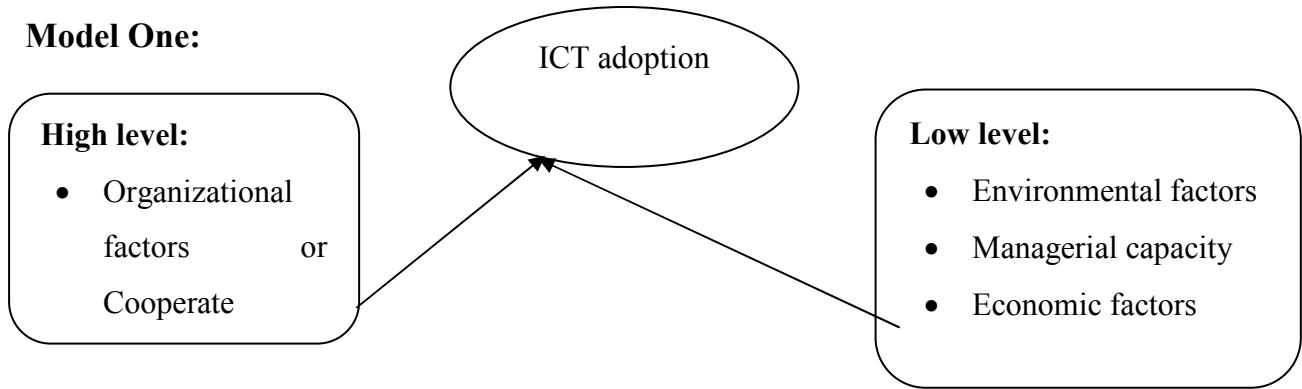
Figure 5.3: The three alternative solutions of ICT adoption drives

Each of the above three formulas in the intermediate solution generated by the software are transformed to a model that can be used to interpret the formulas in to the language of the research objective. The major objective of the research was finding the drives of ICT adoption in the banking industry. Interpreting each formula is based on the fuzzy set operation rules: ‘logical and’, ‘logical or’ and ‘negation’. The presence of a certain condition in the formula is the proof of the conditions being one of the motivations or drives of ICT adoption and the negation of a condition shows the level of the drive is low to medium. The total absence of a condition in the formula shows lack of adequate evidence to group it anywhere.

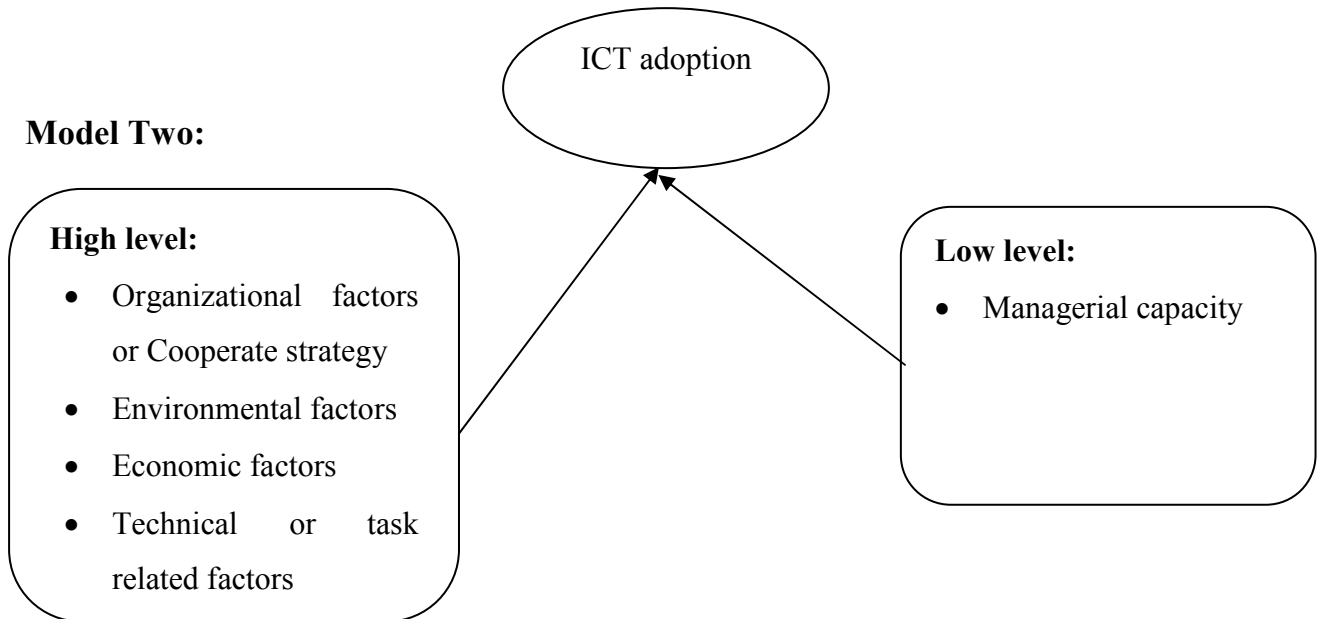
The final process in the model building was choosing one of the three models to represent the final output: ICT adoption model for Ethiopian banking industry. The selection process was supported from two perspectives: the result of the research about ICT drives discussed in Chapter four and comparison between the six solution sets of fsQCA. The comparison between the six solution sets, specifically the formulas of intermediate solution, shows one of the formulas in four of the solution sets with almost the same consistency value. This and the results of the data analysis chapter about ICT drives are used to choose the first formula in the intermediate solution: $mcororg^* \sim menv^* \sim mmgr^* \sim meco$ or model one of Figure 5.4 as the final model of the research.

Generally, the model depicts the current drive of ICT adoption in the banks is the result of the factors related with organization and corporate strategies. Environmental factors, economic factors and management capacity are also present in with less intensity than the above two factors.

Model One:



Model Two:



Model Three:

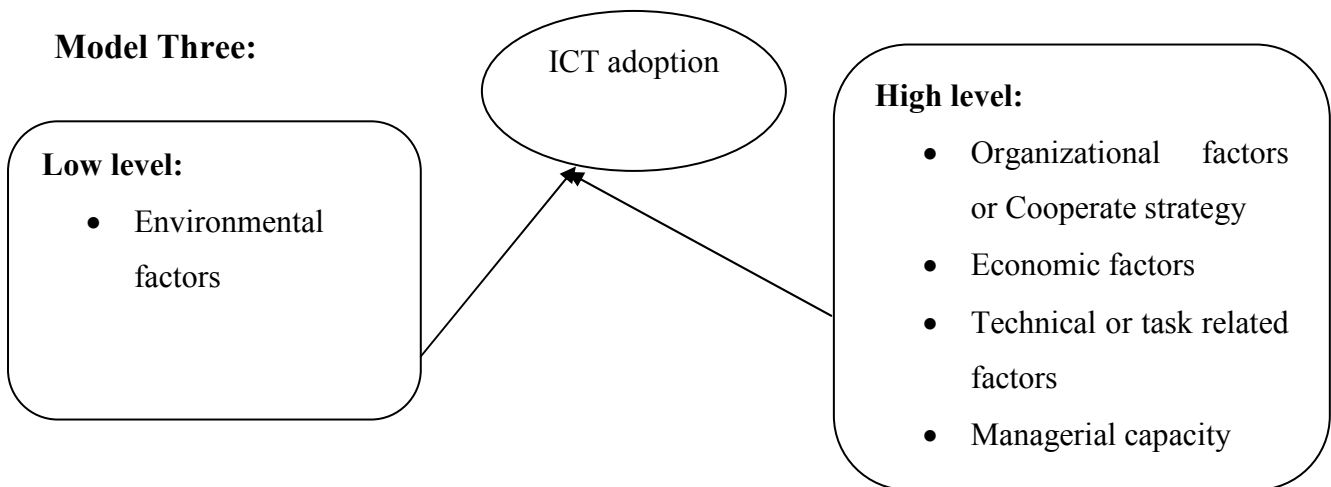


Figure 5.4: The three alternative models of ICT adoption drives

ICT Adoption Model:

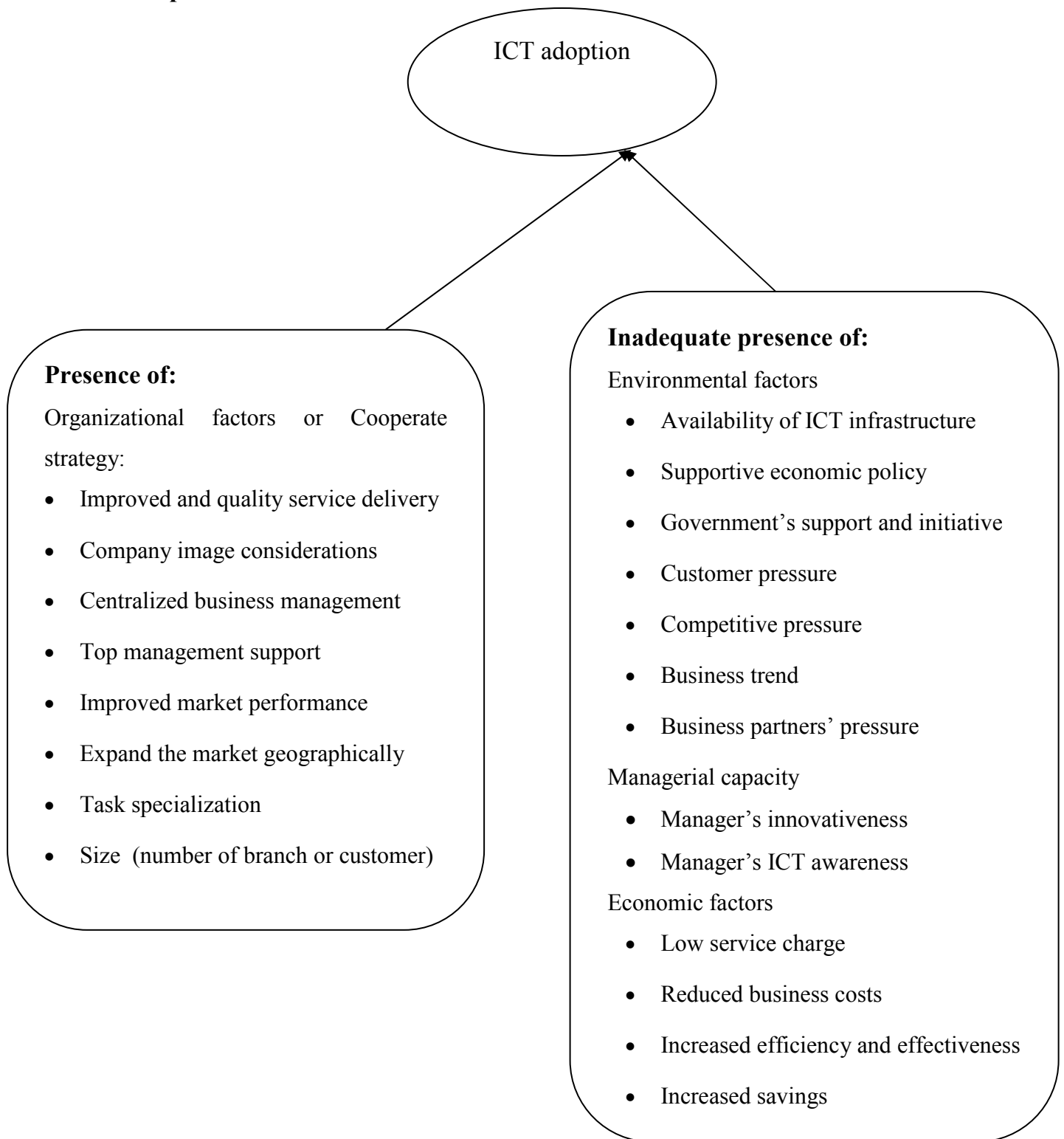


Figure 5.5: ICT adoption model for Ethiopian banking industry

Chapter 6: Conclusion and Recommendation

The research which has started with questions to answer and objectives to achieve has come a long way passing through many vital processes; data collection and analysis could be regarded as the prominent ones. The last chapter of this document is about summarization of the research's findings, implication of the research results from the perspective of the researcher and suggestions designed to pave the way for related researches. It includes four major topics: research question, conclusion, recommendation, and further research.

6.1. Research Question

The research has covered issues of ICT in the banking industry from the availability ICTs and ICT based services to their perceived influence. However, the crucial research objective was developing an ICT adoption model from the standpoint of ICT staffs of the banks using the seven driving factors associated with ICT adoption: corporate strategies, innovation (technical) dynamics, management capacity, task level issues, organizational factors, economic factors, and environmental factors. The results of the research concerning the seven ICT adoption drives are discussed below.

Corporate Strategy

One of the two major ICT adoption drives is corporate strategies. Corporate strategies show the banks' plan on improving the image of the bank, expansion of market and provision of a differentiated service. The result has shown the inclination of many banks in adopting ICT is to use ICT as a means of transforming the business strategies in to reality.

Organizational Factors

Organizational factors, the other major drive in ICT adoption, include issues of top management, business structure, and nature of the bank. ICT is known for its effect of diminishing size and make management as easy as it could get. This feature seems to be understood and utilized by the banks since one of the reasons this factor was on the top of ICT drives is because of centralized business management factor, which is part of organizational factors.

Economic Factors

The banking industry might be too young in using ICT to harvest the economic benefits of ICT. Benefits associated with ICT are reaped in a long term process, which could take years. In any case, the economic factors like reduction of business cost and transaction cost were found to have medium to low level influence in ICT adoption.

Environmental Factors

The environmental factors; the level of ICT infrastructure services, the available legal grounds for security of using and investing on ICT, the adequacy of the ICT policy, the existence of government incentive like low tax and VAT on ICT related products were analyzed to discover their impact on ICT adoption. The above mentioned features are indispensable and determinate of the rate of ICT growth. The better the infrastructure the more ICTs could be adopted and the existing ones can be utilized to their full potential. Legal grounds and policy will create market stability, standard and order in the use and investment of ICT. Lack of these features has diminished the effect they could have on ICT development. The outcome shows environmental factors in the low and medium level influencing groups in adopting ICT.

Management Capacity

Department of ICT with adequate staff members, a head with managerial position and credence in top management is a recent development. Most of the banks' plan about ICT adoption comes from the top management even though the ICT managers are asked to see it through. This bottom up strategy has made the capacity of managers to motive ICT adoption an intermediate level

Innovation (technical) Dynamics

Among the many techniques and tools that are invented to make the business process easy, flexible, and dynamic, ICT could take the bigger half of the credit. Qualities like ease of use and compatibility of the technologies has made ICT the choice of every business. According to the result, the banking industry in Ethiopia was in the same line as the above veracity: the technical dynamism of ICT is one of the motivations for adopting ICT.

Task Level Factors

The growth of ICT in the banking industry could not guarantee success in the improvement of banking activities. The predicament in this case is even if using ICT could revolutionize and reengineer the banking activities, their full bearing cannot be witnessed if there is no recipient. The level of bank users who can align their transactions with the banks using ICT is low. The banks could use ICT to operate twenty four hours a day and seven day a week but there are not enough users to indulge in this kind of high level service. For this reason, task level factor has shown a low level influence in ICT adoption.

6.2. Conclusion

The research was designed in a form of cascading objectives, which has a relation of one objective's output becoming the input for the next objective. The first objective of the research was to survey the ICTs and ICT based services that are currently adopted and those to be implemented in a two year period. The result of currently implemented ICTs and ICT based services could be interpreted in two perspectives: the first is the number of banks using one or more bank related ICTs and ICT based services is substantial and the second perspective is the survey about the available ICTs and ICT based services in the banking industry shows the existence of many varieties. Furthermore, the research shows the intensity of ICT adoption is stronger in the new comers; almost all banks established in the last three years have more ICTs than the banks that stayed longer in the business and have followed a progressive approach in adopting ICT.

The second objective of the research is finding out the major driving factors that have been influencing the banks to implement ICT. The factors were assessed in a three level intensity: high, medium, and low level. The result shows corporate strategies, technical dynamics and organizational factors consecutively motivate banks to implement ICT in high level. At a medium level, environmental factors followed by management capacity and organizational factors are the drivers of ICT adoption. In addition, economic factors, task level factors, and environmental factors constitute the group that has a low level influence in ICT adoption.

The research tried to answer questions concerning problems that are hindering the banking industry from further development in ICT. The findings show the major reasons that are hindering ICT adoption are a group of factors that are related with the environmental issues of the banks: lack of infrastructure, the inadequacy of the ICT policy, lack of legal ground, and high taxes and VAT on ICTs, which support the result of the research about drives of ICT in the above paragraph. In addition, economic factors have proved to be among the major factors with issues like cost of hardware and software. Generally, the barriers of ICT are of poor ICT infrastructure, which always leads to high cost in accessing ICTs and underdeveloped legal policy for ICTs, which create unstable ICT market.

The influences of ICT were assessed from a perspective of three influences and each one is given a value: positive, negative and no influence. The outcome shows the major factors with positive influence are efficiency of business processes, quality of customer service and enhancement of consumer and competitors' image of the bank. Contrary to the common understanding about the effect of ICT in reducing business cost, reduction of operational cost was the leading negative influence factor. According to the result, it seems the influence of ICT has not been yet utilized around staff and staff development since the results include most of staff related factors under no influence: productivity of employees, staff development, and training, motivation of staff and ease of organizational structuring and restructuring.

In addition to the above major findings, the output of some of the objectives has been used for answering the rest of the objectives. The information gathered about the available ICTs and ICT based services has been further analyzed for profiling the banks according to their ICT usage. Moreover, the drives of ICT have been used to develop a model, which shows the relationship between ICT adoption, and ICT drives from different perspectives.

6.3. Recommendation

The following recommendations target different stakeholders: banks, banking industry, the government, policy making bodies, and ICT investors.

The ICTs and ICT based services currently implemented in the banking industry may not make the industry globally competitive but it can be taken as a good beginning with a promise of

growth. However, it has been noted that the incorporation of ICTs is still low in the banking industry of Ethiopia. This suggests a need to adopt an ICT strategy by the banks, placing more emphasis on creating a joint venture or cooperation with the government for general ICT development in the country, creating better ICT infrastructure, and ICT policy. In addition creating awareness about ICT among customers on existence and benefits of ICT is vital for the success of ICT in the industry, which depends on both the banks and the customers. The banks, after creating awareness about ICT, need to understand the society and its' needs concerning ICT in the banking transaction. Like many of the developing countries that are debuting customer based ICT initiatives in hope of achieving the impact in its' customers, we need to create our own ICT initiative that is originated from the customers of the Ethiopian banking industry. It is compulsory for the industry to understand their implementing ICT gadgets do not warrant usability by the customers. An ongoing strategy that updates and aligns the technologies with the customers is required.

The need for enterprise ICT policy is evidently visible from the patched works of enterprise policies in some banks and the unavailability of it in the others. The available ICT policies are general objectives, which are similar with other banks: the policies are not detail enough to depict the situation of the specific bank. Enterprise level ICT policy is like a roadmap for the organization to move from one point to the other. It can be used to make better decision, adopt better and well assessed ICTs, and create standardization throughout the organization. Moreover, these policies would make the industry stronger and united to solve common ICT related problems. The policy might result in creating a favorable environment for sharing infrastructures, which are found duplicated in every bank. Less investment in duplicate infrastructure frees capital for other vital business investments. ICT policy based on the current ICT related situations in the bank, financial industry, and the country is recommended for every bank.

The nature of ICT, which transcends national border, has compelled the global information society to create a global social infrastructure and policy. This policy will bind the countries and their ICT policy for evenhanded ICT benefits and only countries with well formulated ICT policy could be part of it. A national policy is designed and implemented with the power and leadership of a government for its people, apparently the ICT policy should be developed based

on stakeholders' need. A national ICT policy should aim to align ICT with the development goal: Many African countries have made the national ICT policy part of their Poverty Reduction Strategy Program. In addition, ICT policy should create an imperative environment for ICT accessibility and affordability. Furthermore, it is recommended the national ICT policy should include issues to deal with technology development, technology diffusion, ICT skill and awareness, and social and technological infrastructure. Incorporating the above mentioned issues in the national ICT policy requires cooperation between the policymakers and the stakeholders of the policy. In addition, the policy should include specific statements that can be measured rather than a bulk of objectives that cannot be attained or measured. The need for enterprise level ICT policy was shown in the above paragraph. Enterprise level ICT policies cannot be envisaged without a proper national ICT policy. This shows the importance of national ICT policy for the development of ICT in the country and different industries.

National ICT policy is mandatory but, even a well stated and researched ICT policy can do little by itself. The research shows the major barrier of ICT development is lack of infrastructure among other things. In the part of the research where the drives of ICT adoption were identified, the available ICT infrastructure was not one of the major drives. The real problem behind this situation is the underutilization of ICTs in the banks because of lack of ICT infrastructure services. The liberalization of national banking policy has dramatically changed the banking industry. Currently, there are banks that are capable of investing millions on ICT. This could not be enough to utilize the benefits of ICT at industry and country level unless it is supported by the backbone of ICTs and ICT based services: ICT infrastructure services. The solution for this lies in the answer for the question: 'should the ICT infrastructure service be opened for competition'?

The necessity of opening ICT infrastructure service for competition arises from technical considerations inherent to modern communication networks. The services are ever growing and require a constant update and expansion. In addition, the crosscutting nature of the digital economy could only be matched by competitive service givers in the ICT infrastructure service unit. On the other hand, the significance of ICT infrastructure service as a backbone of other critical service sectors such as banking or agriculture could only be achieved through privatized and liberalized environment. The competitors could assist the current service provider by

extending the service to meet the economic and development needs of the country and improve the cost and quality of service, which will facilitate global competition. The existence of the competitors, in addition to creating a better service, could enable integration of networks, optimization of national ICT resource and eliminate the abuse of market that resulted from lack of competition. Generally, introducing competition in to the ICT infrastructure service could enable the government to continue reaching areas where there is no ICT service while the competitors could contribute greatly to the efficiency and growth of the economy and provision of affordable and enhanced services for the public.

In addition to the technical considerations of the service, opening ICT infrastructure service for competition could be perceived from the country's economic situation. Considering the current state of the ICT infrastructure service and recent developments in further investments to improve the infrastructure, the only provider of the service, ETC, could not do any better. From development angle, the country has to balance its spending with all sectors: agriculture, education, health or finance. This implies development of ICT infrastructure services might not go any faster than the current pace. With the current ICT infrastructure development pace, the government being the only service provider, ICT could not be incorporated in every sector or used to the extent of its full potential.

The need for liberalized market for ICT infrastructure services is not to undermine the role of the current service giver. From the perspective of universal access to ICT services for the majority, having the regulatory power of the government is appropriately needed. Pure competition policy could not be the solution for sustainable ICT infrastructure service considering the current ICT infrastructure related situations of the country. In addition, the new comers could not easily penetrate the economics of scale dominated by the government even if a room for competition is opened. Infrastructure services are characterized by a very large fixed cost and could take years to recover or could become unrecoverable if the market does not respond well. Creating a pure competition in this kind of industry could drive out some and could bankrupt the rest. The good news in this is ICT infrastructure service does not need to be independent and solid systems: a network of networks could be created with each segment exposed to an open competition. This is

a perfect scenario for the Ethiopian case where everyone could benefit with a little change in the industry: opening the ICT infrastructure service for private organizations.

6.4. Further Research

Products or prototypes are more convincing than a verbal report describing a situation based on the insights and experience of the researcher, which has made social research a bit oblivious to be taken seriously. This problem could go worst when the social research is pure qualitative or the mesh of qualitative and quantitative. For sociologist and anthropologist this problem is elevated since they are after all social scientists. Information science, at least the information science in this country, is still swinging between applied science and social science. This could explain the stack of research papers with insignificant amount of social research in it.

Information scientists are responsible to understand the impact of ICT on the country and its' people, the economical, social, political, and educational significance of ICT. In addition, information scientists are the sole responsible people to plan, study and formulate an ICT policy for the country as well as different enterprises and industries. This could be better accomplished through cooperation between industries and the government for assessing ICT and its implication in different industries at a country level. Further research could be conducted in the banking industry by broadening its scope. There is a great opportunity created for researchers to explore the existing ICT environment to produce the much needed strategy of how best to use ICT for social and economical development, modernization of different sectors include banking and use the power of information to create quality of life and be part of the global ICT industry.

From methodological perspective, social research using the QCA method is becoming the trend in many social inquiries especially policymaking. QCA is a straightforward technique with qualities hard to find in any other research methodology. Among this, the power of the researcher in experimenting with different outcomes and the involvement in every step of the way would make it an ideal social inquiry tool. It is my strong belief QCA would be the right tool for the research in search of relationships between entities, which most social researches are.

Generally, researchers interested in assessing the influence of ICT on the banking industry could do exploration by changing scope or sample population.

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Appendix A: Questionnaire

Dear Sir/ Madam,

I am a graduate student in the Department of Information Science of the Faculty of Informatics at Addis Ababa University. I am conducting a research study for my Master's thesis in partial fulfillment of the requirements for the MSC degree in Information Science.

The attached questionnaire is designed to gather information from you in the capacity as the ICT manager of the bank, to be used only for the intended purpose of the research.

I hereby request your participation in completing the questionnaire, and would be grateful for your cooperation and valuable time.

Sincerely,

Meseret Yohannes

1. Please state your current position or title in the bank _____
2. Number of branches _____
3. Number of branches with all Information Communication Technologies (ICTs) and ICT based services of the bank _____
4. Has it been practical to measure benefits of ICT in terms of monetary value before investing in ICT? Yes No (if yes, go to question number 6)
5. What measures have been considered to make sure investments on ICT has a positive return?

6. Do you agree that all the ICTs currently implemented in your bank are mandatory for the business operations of the bank? agree agree somewhat disagree
 I do not know
7. Does every ICT staff in your bank have a computer access in the office? Yes No
8. Does your bank have Internet connection? Yes No, (if no, go to question number 11)
9. Does every ICT staff in your bank have an Internet connection? Yes No
10. The type of Internet connection in your bank is..... Dial- up Broadband
other _____
11. What are the ICTs and ICT related services your company has implemented currently and technologies that are to be implemented in the near future, (the reference for near future is not more than two years)? (tick as many as appropriate)

IC technologies and services	Currently implemented	To be implemented in near future
Stand alone computer.....	<input type="checkbox"/>	<input type="checkbox"/>
Internet access	<input type="checkbox"/>	<input type="checkbox"/>
WAN networks	<input type="checkbox"/>	<input type="checkbox"/>
Internal networks / Intranet		
Wireless LAN.....	<input type="checkbox"/>	<input type="checkbox"/>
Wire based LAN	<input type="checkbox"/>	<input type="checkbox"/>
Extranet	<input type="checkbox"/>	<input type="checkbox"/>

IC technologies and services	Currently implemented	To be implemented in near future
Telephone banking	<input type="checkbox"/>	<input type="checkbox"/>
Webpage services	<input type="checkbox"/>	<input type="checkbox"/>
E-home banking	<input type="checkbox"/>	<input type="checkbox"/>
E-office banking	<input type="checkbox"/>	<input type="checkbox"/>
E-invoices services	<input type="checkbox"/>	<input type="checkbox"/>
E-signatures services.....	<input type="checkbox"/>	<input type="checkbox"/>
Automatic teller machine (ATM)	<input type="checkbox"/>	<input type="checkbox"/>
Smart cards	<input type="checkbox"/>	<input type="checkbox"/>
Magnetic check reader	<input type="checkbox"/>	<input type="checkbox"/>
Electronic fund transfer	<input type="checkbox"/>	<input type="checkbox"/>
Electronic data exchange	<input type="checkbox"/>	<input type="checkbox"/>
Computerized credit rating	<input type="checkbox"/>	<input type="checkbox"/>
Automatic bill payment (ABP)	<input type="checkbox"/>	<input type="checkbox"/>
Business to business transaction	<input type="checkbox"/>	<input type="checkbox"/>
Business to government transaction	<input type="checkbox"/>	<input type="checkbox"/>
Customer interaction via the Internet	<input type="checkbox"/>	<input type="checkbox"/>
Banking software systems	<input type="checkbox"/>	<input type="checkbox"/>
Open source operating systems	<input type="checkbox"/>	<input type="checkbox"/>
CRM (customer relationship management)	<input type="checkbox"/>	<input type="checkbox"/>
ICT security systems	<input type="checkbox"/>	<input type="checkbox"/>
Staff and customer authentication systems	<input type="checkbox"/>	<input type="checkbox"/>
Other, please specify _____		

12. Please select from the following items those that appropriately describe the level of ICT adoption drives on your bank's' decision to implement ICT.

ICT adoption drives	High	Medium	Low
Corporate strategies			
Improved and quality service delivery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Expand the market geographically	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Improved market performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Company image considerations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Organizational factors			
Size (number of branch or customer)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Centralized business management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Task specialization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Top management support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Economic factors			
Low service charge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increased efficiency and effectiveness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Increased savings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduced business costs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Management capacity			
Manager's innovativeness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Manager's ICT awareness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Environmental			
Customer pressure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Business trend	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Business partners' pressure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Competitive pressure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ICT adoption drives	High	Medium	Low
Availability of ICT infrastructure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Supportive economic policy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Government's support and initiative	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Innovation (technical) dynamics			
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality of IS systems and capabilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Compatibility	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Task level			
Autonomy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Speed up business processes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Extend beyond normal business hours	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Launch new services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Link internal and external business processes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. Please specify, if ICT has any influence or no influence at all in the following areas.

Factors	Positive influence	Negative influence	No influence
Growth of revenue	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reduction of operational cost	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Efficiency of business processes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Internal work of the bank	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality of customer service	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Quality of services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Productivity of employees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Factors	Positive influence	Negative influence	No influence
Motivation of staff	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Staff development and training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Competitive advantage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enhance consumer and competitors' image of the bank	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flexibility/ adaptability of business activities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ease of organizational structuring and restructuring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. What are the barriers of ICT development in your bank? (tick as many as appropriate)

- Lack of perceived economic or other benefits to the bank
- The size of the bank is not feasible for ICT investment
- Fear of technology
- Reluctance of personnel to use ICT
- Inability of employees to use ICT
- Customers are not prepared to use ICT based services
- ICTs are too complicated
- It is difficult to find reliable ICT suppliers
- The supply of ICT is not matching the ICT needs of the bank
- ICT expenditures are limited
- Expensive hardware
- New versions of existing software introduced too often
- Expensive software
- Difficult to recruit qualified ICT personnel.....
- Qualified personnel are expensive
- Taxes are too high on hardware and software

- Unreliable legal ground for ICT investment
- Lack of security and privacy on the Internet
- Lack of ICT infrastructure
- Lack of government incentive
- Inadequate ICT policy
- VAT on ICTs is high

Other, please specify _____

15. What are your perception of the government policy objectives and their level of attainment concerning ICT in the financial sector?

Policy objectives	Attained	Progressive	Failed	Don't know
Modernize the banking system to facilitate the development of e-commerce and trade.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Upgrade and expand communications and Internet delivery infrastructure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Enact laws and regulations that promote and facilitate electronic cash payment systems to promote the development of e-commerce.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Make the Internet a secure environment for local, regional and global e-commerce to ensure effective consumer protection and confidence in doing business online.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Take appropriate measures to ensure that ICT will be used in all sectors based on international interoperable standards.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Establish standards for interconnectivity and interoperability of computer networks.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. Do you consider the current ICT policy framework of the country sufficient for sustainable ICT adoption in the banking industry? Yes No (if yes, go to question number 18)

17. What are your recommendations of ICT policy strategies?

18. Does your bank have an enterprise level ICT policy? Yes No (if yes, go to the next question)

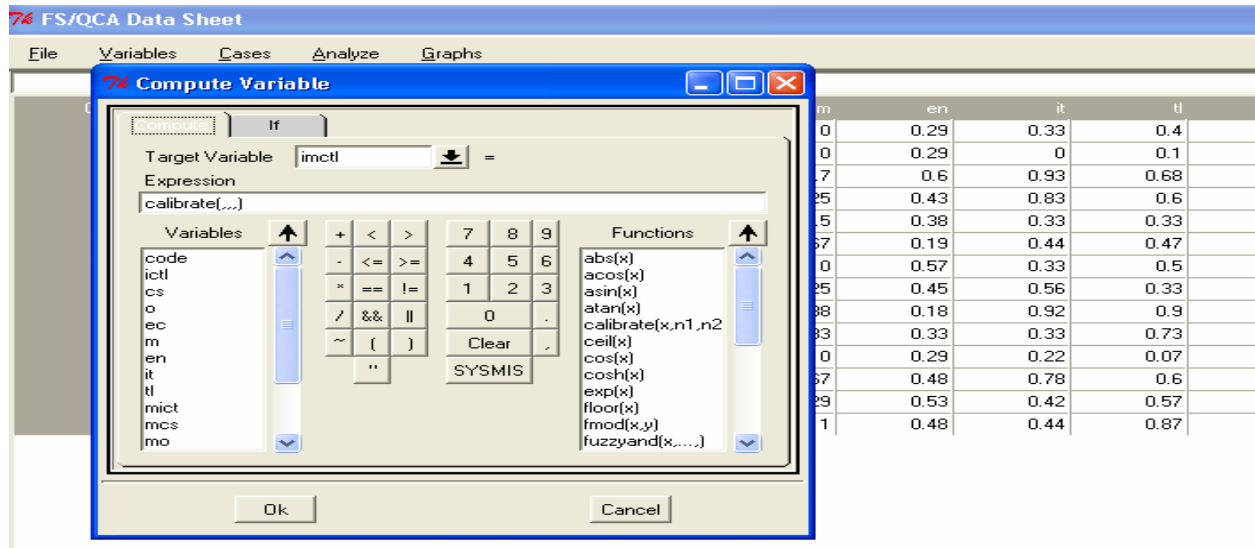
19. What are the major objectives of the policy?

20. What strategies have you been following to achieve the objectives?

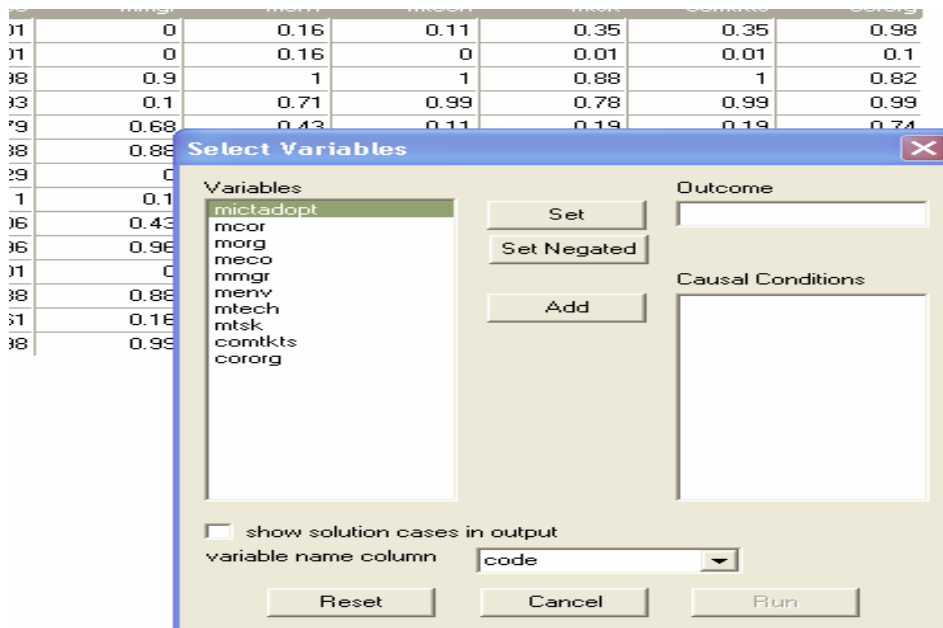
Thank you

Appendix B: fsQCA User Interfaces

1. User interface for calibrating fuzzy set value



2. User interface for specification of causal and outcome conditions



3. User interface of the output/ model with consistency and coverage analysis

```
*****
*TRUTH TABLE ANALYSIS*
*****

File: C:/Documents and Settings/user/My Documents/ResearchRelated/DataAna/truthtablealgo.csv
Model: mictadopt = f(cororg, comtkts, menv, mmgr, meco)

Rows:      2

Algorithm: Quine-McCluskey
  True: 1
  0 Matrix: 0L
Don't Care: -

--- INTERMEDIATE SOLUTION ---
frequency cutoff: 1.000000
consistency cutoff: 0.812950
Assumptions:

              raw      unique
              coverage  coverage  consistency
              -----  -----  -----
cororg*comtkts*menv*~mmgr*meco  0.221018  0.175515  0.890830
cororg*comtkts*~menv*mmgr*meco  0.191766  0.146262  0.898477
solution coverage: 0.367281
solution consistency: 0.931319
```