A Conceptual Framework for ICT Assimilation in Ethiopian Public Organizations

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ABSTRACT - Information and Communication Technology (ICT) affects how organizations deliver services to their customers. ICT is now used not only to improve back office routine activities but also to act as strategic partner for achieving organizational goals. It increases internal efficiency and reduces costs. Although ICT has many benefits for organizations, its assimilation is the most challenging process as there are high failure rates as reported by many researchers. This paper identifies lack adequate knowledge on factors that affect ICT assimilation in public organizations as a research. The paper fills this research gap by stating factors that contribute for the successful ICT assimilation in public organizations. The extant literature in this area is focused on high-income countries. There is a dearth of ICT assimilation research in low-income countries like Ethiopia. Therefore this study will also contribute new knowledge on ICT assimilation in public service organizations from developing economies perspective. The result of the research will be used as guide for policy makers and practitioners to successful assimilate ICT in their respective organizations.

Keyword - ICT assimilation, public organizations, organizational context, technological context, environmental context

I. INTRODUCTION

ICT enables organizations to improve their performance. It provides the infrastructure for economic development, contributes to innovation and development of economic growth [1]. It helps to improve internal operations and reduces costs, innovate new products and services [2], [3]. For example, organizations can publish their product information on a Website and make easy access to their customers. This arrangement encourages open markets and value-added services that are inconceivable in a world of closed trading partner relationships [4]. ICT is used as one of strategic resources to achieve organizational objectives.

ICT integration within the organization is a very demanding process. Implementing ICT projects within budget and schedule does not mean organizations have achieved the benefits of ICT. ICT is integrated in the organizations at different stages of cycles starting from initiation
phase to adoption, implementation and assimilation [2], [5]. Managers as well as practitioners believe that completion of ICT projects within budget and schedule as a success. Little attention has been given after project implementation phase, specifically at assimilation phase [2]. Organizations enjoy the capabilities of ICT to minimize costs and innovate new products and services when they assimilate and imbedded in their value chain activities [5] [6].

Although ICT is considered as vital instrument to increase organizational performance, the high failure rate of ICT projects shows insufficiency of information how to best assimilate ICT in the organizations. The new system brings disruption to the existing organizational culture. Bajwa et al [7] states that “…the assimilation of ICT in an organization can lead to different ‘end states’ or ‘transitional states’ as IT innovations are acquired and deployed”. Employees need to learn new routines which require extra effort “…or they may also be ‘de-skilling’, requiring workers to be less skilled than previously [8]”. Users will also develop resistance to new innovations if they perceive learning new technology is too difficult or complex [9]. Some may also see the new innovation as a threat to their existing power as it brings a power shift in the control of information resource within the organization. As a result, ICT assimilation process has usually encountered a high failure rates that went up to 70 percent [10]. The failure is higher for developing countries than developed countries [3]. A study by Heeks [11] on more than 40 e-Government development projects in developing countries reveal that around 35 percent from these projects were totally fail, while 50 percent partially failed, and there is only 15 percent were success [3].

This research identifies high failure rate of ICT assimilation as research gap. The researcher also believes that factors that affect ICT assimilation are context dependent and the need to investigate factors that contribute for successful ICT assimilation with empirical data. In addition there is also little research on ICT assimilation in low-income countries like Ethiopia as the factors that are identified for one context may not work well for other contexts. Previous research on ICT focussed on ICT adoption and implementation with little regard to ICT assimilation [13]. This also calls for additional research on ICT assimilation. Therefore this research will answer the following research question:

- What are the important factors that strongly affect ICT assimilation in the Ethiopian public organizations?
- What are the indicators that reveal successful assimilation of ICT in Ethiopian public organizations?

A. Specific Objectives

1. To identify factors that affect ICT assimilation in public service organization in Ethiopian context.
2. To state attributes that indicate successful assimilation of ICT in Ethiopian public organizations

B. Research Methods

A content analysis method was used to develop the conceptual framework that is used to investigate factors that affect ICT assimilation in Ethiopian public organizations. First the researcher collected relevant literature on ICT assimilation by assessing their title and then their abstract and content. Concepts collected from different literatures were categorized to create
more abstract categories. The researcher also established relationships between or among concepts whether the relationship is causal, composition or associative.

II. LITERATURE REVIEW

ICTs increase organizational competitiveness by facilitating internal operations, flow of information and the development of new or improved products and services. For example firms using e-mail for customer communication showed a growth of 3.4 per cent faster in terms of sales than those which do not [13]. ICT improves organizational performance in value chain activities. For example web based customer support service reduces cost, increases sales and improves supply chain coordination [14]. In order to bring such benefits in the organization, ICT has to be accepted, adopted and assimilated in organizational routines and procedures. There are different ICT tools and systems that are used by organizations to improve their operations. In this research, we are referring to an ICT system that is adapted and implemented by organizations to improve their internal operations as well as external relationships with their customers and suppliers.

ICT system is complex system for the organizations as it brings drastic change in business operation [23]. It can be considered as organizational innovation. As Davenport [25] points out ICT “… provides real time access to operating and financial data, the systems allow companies to streamline their management structures, creating flatter, more flexible, and more democratic organizations”. Since all organizations data are stored in one location, ICT improves data quality and data integration from different departments of the organization. This improves smooth flow of information within the organization and timely business decisions based on sound information. ICT also increases transparency and accountability which is the main problems of organizations in the developing countries. Possession of ICT system has become a critical asset for organizational adaptability to environmental changes [23].

ICT project implemented at three phases –ICT adoption, ICT implementation, and ICT assimilation [12]. Markus et al [26] also identify three phases of ICT integration which include (1) the project phase during which ICT software is configured and rolled out to the organization, (2) the shakedown phase during which the company makes the transition from ‘go live’ to ‘normal operations’ and (3) the onward and upward phase during which the company captures the majority of business benefits (if any) from the ICT system and plans the next steps for technology implementation and business improvement. Kouki et al [2] state ICT integration as four cycle processes which starts from initiation, adoption, implementation and assimilation. Assimilation is labelled as one distinct phase which comes after implementation phase.

The issue of successful ICT assimilation have different connotation among practitioners and researchers. Some argue that ICT projects completed within schedule and on budget are considered as successful projects as predict later performance [2]. Such assumption; however, ignores emerging events that can drastically affect the success of the project to meet its intended purpose. Others argue that successful project implementation and assimilation are not the same [25], [5]. A project which is successfully implemented may be used for its proper functionalities which results in system underutilization. Armstrong and Sambamurthy [5] claim that system underutilization is considered as project failures. It only during assimilation phase ICT projects are routined in business value chain activities and create business benefits [5], [2], [6].

It is important to clarify the concept of ‘assimilation’ and ‘ICT assimilation’ in the context of organization. Dictionary.com defines the word assimilation ‘to become absorbed, incorporated,
or learned and understood’. Although the word originates from anthropology, it is widely used in other disciplines such as sociology, management science and marketing. For example assimilation of migrants implies integrating new comers to adapt the culture (such as language, food and work practice) of host society. ICT assimilation refers to the extent to which the use of a technology diffuses across organizational work processes and becomes routinized in the activities associated with those processes [6]. It also indicates the ability of the organization to utilize the capability of the technology to improve their business performance [5]. Therefore the assimilation phase of ICT is more important to see whether investment on ICT brings business benefit or not.

How do we know successful assimilation of ICT in the organization? Markus et al [26]. mention three indicators of successful ICT assimilation- (1) achievement of business results expected for the ICT project, such as reduced IT operating costs and reduced inventory carrying costs, (2) Ongoing improvements in business results after the expected results have been achieved, and (3) Ease in adopting new ICT releases, other new ITs, improved business practices, improved decision making, etc., after the ICT system has achieved stable operations. If ICT has online communication support, users prefer to use online tools such as e-mail, workgroup computing and online inquiry instead of telephone or paper documents to exchange information [27]. Users develop a positive attitude to work on the system [2]. They use the system as the only means of accomplishing their tasks. Users also start to use the system in some innovative ways that were not envisioned by the system’s designers [27].

Liu et al [12] identify the pattern of ICT assimilation in the range between shallow and deep assimilation. The shallow assimilation of ICT is just using ICT to support routine activities while deep assimilation refers to application of ICT for business decisions and strategies such as creation new products and services. Musaji [27] also states the presence of different levels of ICT assimilation. Users try to use the system functionalist at the lower level of assimilation. As users get experience with the system, the use of the system in some innovative and creative way than was anticipated by the system designers is an indication of higher level of ICT assimilation [23].

A. Theoretical Lenses

ICT systems are usually considered as new innovations to adopting organizations as they bring changes to the current working practice. One of the most cited theories that is used to investigate diffusion of new innovation is Roger’s diffusion of innovation theory [15].This has been used by many researchers to investigate information technology diffusion and assimilation in the organizations [2], [3]; [16]. The diffusion of innovation theory identifies four factors that affect adoption of new innovation: (1) the innovation itself, (2) the communication channels used to spread information about the innovation, (3) time, and (4) the nature of users [15]. A very interesting innovation is a telephone innovation which is very easy to learn and use it. Adequate information on the new innovation creates a positive belief on users about the benefit of the new technology. Users need time to accept, adopt and use the new innovation [15]. All users do not have the same understanding to new innovation [17]. This is usually depends on users educational level, age, gender, experience and other factors [18]. Differences in user characteristics also result in different acceptance rate of new innovation.
Diffusion of innovation theory explains factors that affect individual acceptance of new innovation. It is not sufficient to explain the diffusion of innovation in a complex organization where decisions are made at different hierarchies of the organizations and involve consensus of group of individuals. Tornatzky and Fleischer [19] argue that IT assimilation in the organizations depends by Technological, Organizational and Environmental context and develop a TOE framework. Technological context is represented by availability of the necessary IT infrastructure and knowledgeable IT staff [20]. The technical people are responsible to build and leverage technology assets and plan an IT infrastructure in the organization. Once the necessary technologies are in place, the IT staffs are also responsible to manage and maintain the technologies in place. The technical IT staffs have intangible knowledge which is acquired through experience and is important for successful ICT assimilation. Organizational context includes organizational compatibility, top management support, rewards and incentives, management structure, scope and its size [6], [21],[3]. On the other hand, different researchers use institutional theories to identify environmental factors that affect ICT assimilation in the organization [22], [23].

Liang et al [22] identify government policies, professional associations and networks and environmental uncertainties as important environmental factors that pressurize organizations to assimilate IT. Tornatzky and Fleischer [19] also state nature of the organization, competitive pressure, regulatory environment and customer readiness as elements of organization environment. Organizations which operate in competitive environment are open to new changes that can bring efficiency and cost saving [6]. Public organizations, however, are not sensitive to environmental pressures like competition as private organizations. DiMaggio and Powell [24] claim that organizations are not mainly motivated to adopt and assimilate ICT to increase their efficiency by external competition pressure rather from pressures to make them legitimate in their external environment. This process makes organizations to become more isomorphism without necessarily making them more efficient [2]. “This process … is effected largely by the state and the professions, which have become the great rationalizers of the second half of the twentieth century” [2]. DiMaggio and Powell [24] identify three types of organizational isomorphism – coercive, mimetic and normative.

Coercive isomorphism comes from pressures of government. Government issues different regulations and policies that forces organizations to adopt new innovations without competitive necessity. For example the government of Ethiopia forces all institutions to apply business process reengineering to change their existing structure and increase their internal efficiency. Such government pressure removes institutional diversity and results in the creation of more homogeneous organizations. In the case of ICT, organizations may be forced to change their structure to fit to the demands of their dominant suppliers or customers [2]. If most of the organization’s customers prefer the service to be delivered through web, organizations are forced to deliver their services over Internet in order not to lose their customers.

Mimetic isomorphism results as organizations respond to uncertainty by mimicking actions of other organizations [22]. When organizations fail to adapt to their environment, they try to imitate the most successful organizations which results in organizational homogeneity. Implementation of ICT project is risky project whose failure is known only at the end of the project. Many organization try to copy from already successful organizations to avoid risks that may arise from new and unique projects [2].

normative isomorphism occurs primarily as a result of professionalization defined as “the collective struggle of members of an occupation to define the conditions and methods of their
work, to control the production of the future member professionals, and to establish a cognitive base and legitimization for their occupational autonomy” [24]. IT professionals working in different organizations may engage in knowledge sharing activities through conferences, training and other professional events [2]. This knowledge sharing results in development of shared language and practices which eventually results in normative isomorphism. Teo et al [28] undertake an empirical study to validate if institutional isomorphism has an impact on organizational IT adoption and find that organizations adopt IT due to coercive, mimetic and normative pressures.

The three theories discussed above will give us a complete picture about factors that affect ICT assimilation in the organization. Accordingly we identify three important constructs that affect ICT assimilation in Ethiopian public organizations. These are technological, organizational and environmental contexts. The relationship of the identified constructs and ICT assimilation is shown in Figure 3.

![Proposed Conceptual Framework for ICT Assimilation in Public organizations](image)

**Figure 1** Proposed Conceptual Framework for ICT Assimilation in Public organizations.

**B. Description of Conceptual Model**

1) **Technological context**

Technological context has two important components that affect assimilation of ICT in the organization. These are ICT attributes and technical expertise of IT staff [2]. According to diffusion of innovation theory, innovation characteristics are an important factor that affects adoption of the new innovation [15]. Moore and Banbasat [29] identify voluntariness, relative advantage, compatibility, personal image, ease of use, visibility and result demonstrability as important characteristics of ICT that affects user satisfaction. The two authors claim that the impact of these attributes on ICT assimilation can be better assessed by measuring users’ perception than directly measuring utilization as perception is antecedent factor of utilization. Davis [30] uses perceived ease of use and perceived usefulness to measure users’ acceptance of a new technology. The researcher selects perceived ease of use and perceived usefulness. These constructs are intensively used by many researchers to measure acceptance of new technology by users in the organization [23], [30].
Perceived usefulness is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance [30]. The users need to get information how the new technology will be used and solves their current problems. Provision of adequate information in the form of user manual and technical support services will increase users’ knowledge of ICT system and their intention to use it. On the other hand, perceived ease of use refers to “the degree to which a person believes that using a particular system would be free of effort” [30]. The ICT system should be simple to learn and use it. Compatibility between old and new technologies is an important feature for successful adoption of the new technology. Such similarity will reduce the learning effort and the transition from old to new technology will be seamless. The new technology enables users to perform their task with minimum effort as compared to the existing technology [17]. Wu and Wang [31] empirically verified the influence of ease of use, relative advantage and compatibility on ICT system assimilation. A good example is integration of a telephone technology in the office. The telephone technology is easy to use and has perceived usefulness over existing technologies and it is easily assimilated in the organizations’ routines.

Hypothesis 1: ICT attributes has a direct impact on ICT assimilation in the organization

ICT expertise is defined as one having a knowledge and skill to operate organizational ICT infrastructures and provide reliable support to end users [3]. After implementation of the ICT system, it is the responsibility of the technical support staff to solve end users problems and maintain the system [2]. Technical support staff needs to have skills to solve end users problems. They also possess the necessary knowledge and skill to configure and scale up the existing system to incorporate emerging user and organizational needs. Therefore the presence of ICT expertise in the organization increases the rate of technology assimilation within the organization [2]. Many systems are failed or underutilized due to lack of proper support during the ICT assimilation process. Therefore it can be hypothesized that

Hypothesis 2: Reliable technical support service will positively affect ICT assimilation in the organization.

2) Organization context
Organizational context includes organizational compatibility, strategic alignment and top management support. Organizational compatibility refers to the perceived alignment between the IT innovation and the culture, values, and preferred work practices of the assimilating organization [22]. A good technological innovation is the one that is perceived as being consistent with existing operating practices, beliefs and values, past experiences, and needs by members of the organizations [3]. In such condition, ICT can be successfully assimilated and brings the expected business benefit. Therefore it can be hypothesized that

Hypothesis 3 - organizational Compatibility will have an influence on ICT assimilation in the organization

Top management support consistently mentioned as important factor for success of IT projects implementation and assimilation [6], [2], [3]. “Top management championship is a metastructuring action because it defines institutional norms and values regarding how managers
should engage in structuring actions related to the Web technology [6]. They also have clear vision how ICT applications are used to create new opportunities and solutions such as operational efficiency, better customer service, and increased ability to compete [20]. Leaders are also responsible to manage conflicts and resistance in the course of ICT assimilation [5]. The higher need of managers for ICT increases organizational level ICT assimilation [12]. Without the top management support, the process of ICT assimilation will not be materialized. Top management commitment for ICT assimilation is indicated by top management belief and participation for ICT assimilation [6]. If the top management team has a positive belief for ICT, they are willing to participate in the process of ICT assimilation by communicating the benefit of ICT for the organization and availing the necessary resources. Therefore the top management championship has a direct influence on ICT assimilation in the organization [3], [6].

**Hypothesis 4:** Top management commitment for ICT systems will have a strong influence on the success of ICT assimilation in the organization.

The importance of strategic alignment on success of ICT assimilation is extensively reported in the literature. The gap between IT system objectives and business strategies is one of the causes for the failure of many IT projects in the organization [2]. Organizational strategies are usually including cost reduction, improving internal efficiency, improving quality of service and maximizing profit. If ICT is developed to support the business needs, it can be easily assimilated by end users without resistance [12]. Such strategic alignment also ensures the system relevance to the user job [6]. Users use ICT as tools to accomplish their job. Senior management are also willing to support the system by allocating budget and providing the necessary training opportunities. This results in system sustainability. Therefore it can be hypothesized that:

**Hypothesis 5:** Strategic alignment of the ICT system will have a positive influence on ICT assimilation in the organization.

Rewards and compensation mechanism influence ICT assimilation in the organization. ICT is a new innovation to the organization. It requires employees to learn new skills and knowledge. Unless employees develop learning capability, they will not able to use the functionalities of ICT systems. Organizations should create an environment that facilitates on-job learning for their employees. One way they encourage such behavior is by motivating employees through reward and compensation mechanism to learn and apply new knowledge and skills for success of their organization [21]. Compensation and reward mechanism also help to retain senior IT staff who leave organizations for better payment [2]. IT staff have unique knowledge and skill which is desired by other organizations [2]. Low payment in public organizations is one of the frequently cited problems for high employment turnover in developing countries [2]. Unless the organizations retain their senior IT staff, it is very hard to assimilate ICT in their value chain business activities. The staffs invest a lot of time to learn how to operate and maintain the system. When organizations lose such people, they are losing their knowledge which cannot be substituted from anywhere in a short time.

**Hypothesis 6:** Reward and compensation mechanism will have a positive impact on ICT assimilation in the organization
3) Environmental context

The two important environmental factors that affect ICT assimilation in public organizations are institutional isomorphism and consultant support. Pudijanto and Hangjung [3] state the direct impact of coercive pressure on e-government assimilation. Governments encourage usage of e-government by formulating policies and providing budgets for development and implementation. Such government pressure is to make institutions modernize without competitive necessity pressure. Likewise governments encourage ICT assimilation in Ethiopian public organizations by formulating policies that allow organizations to pay better salary and other incentives for core IT staff. Therefore it is hypothesized that:

Hypothesis 8: Government policy will have an influence on ICT assimilation in the public organizations.

Kouki et al [2] mention the impact of consultant effectiveness on ICT assimilation. Many organizations implementing ICT system don’t have good experience in using ICT to support their operational activities and business strategies. Haines and Goodhue [32] also assert that it is very difficult for organizations to successfully assimilate ICT systems without external support. The consultant involve at different levels in ICT implementation – project planning, implementation and maintenance. Haines and Goodhue [32] argue organizations which are entirely dependant on consultants in all project life cycles will not develop internal capacity to assimilate ICT systems in their business routines.

Consultants are usually selected based their reputation, experience and costs. Haines and Goodhue [32] stress the necessity to consider the consultant’s knowledge transferring capability as one criteria in the selection of consultants. This knowledge transferring capability creates internal capability of the organization to successfully assimilate ICT. The higher level of consultant’s involvement in knowledge transfer facilities learning of ICT system that would require more time and resource if learning is done do it by your self approach. Therefore the level of consultant involvement in ICT project implementation and knowledge transfer to the organizations are the two important variables of consultant support that strongly affects ICT assimilation in the organization. Therefore it is hypothesized that

Hypothesis 7: the level of consultant involvement and knowledge transfer will have a strong influence on ICT assimilation in the public organizations.

III. Conclusion

ICT has a lot of potentials to increase organizational performance. However the rate of IT failure is very high among organizations which initiate and implement IT projects. Implementation of ICT projects within schedule and on budget does not imply that organizations are securing the benefits of ICT. Before ICT creates value to the organization, it has to be routinized and embedded in the business value chain activities. This study proposed a model based on diffusion of innovation theory and Technological, organizational and Environmental Context Framework (TOE) that is used to assess the factors that contribute for successful ICT assimilation Ethiopian public organizations. As the model is based on two theories, it gives a better picture for managers and practitioners to identify what factors affect ICT assimilation in
their organization. The research revealed that ICT assimilation is a complex phenomenon which is affected by technological, organizational and environmental factors. This model can be also used by other developing countries which have similar socio-economic condition to Ethiopia.

Reference


[13] Qiangeal

