Assessment of ERP Assimilation: The Case of ethio telecom

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Abstract

All ERP projects, i.e., the adoption, implementation and assimilation of ERP systems, are done with the aim of getting the intended benefits from the ERP system. Moreover, many researches have shown that effective ERP assimilation plays greater role in order to achieve intended benefits of the ERP system. Since ERP projects are very expensive, for countries like Ethiopia, it is intolerable to accept failure to get return over investment (ROI). Thus, in order to reduce failures, especially due to assimilation problems, and to realize the intended benefit of an ERP system, first it needs to be assimilated well with its users.

This explanatory case based study assesses the ERP assimilation in Ethio telecom based on the technology acceptance model and theory of interference. The research identified success factors that predict ERP assimilation. This are Perceived usefulness (PU), user attitude (UA), and unlearning. In addition, training, empowering users, separate operation support, promoting ERP system are external factors that support the above factors. Finally, this study proposed ERP assimilation model called TAMI, which considered the combined elements of Interference theory and technology acceptance model.

Keywords: ERP; ERP Assimilation; Technology Acceptance; Interference Theory

1. Introduction

ERP is business process management software that allows an organization to use a system of integrated applications to manage its business and automate many back office functions related to technology, services and human resources. According to [5], an ERP system mainly consists of multiple enterprise software modules that are purchased individually, based on what best meets the specific needs and technical capabilities of the organization.

Technology assimilation in general is defined as "the extent to which the use of technology diffuses across the organizational projects or work processes and becomes routinized in the activities of those projects and processes [3]. Hawari and Heeks [10] define ERP assimilation at organizational level as "the extent to which the ERP technology is used in facilitating business processes and the degree it is routinely used to support business operations". According to Fichman [7], diffusion is "the process by which a technology spreads across a population of organizations".

An ERP system provides many benefits to enterprises. It has the ability to empower users if it is assimilated well; it provides accountability and responsibility in a way not available before [5]. With the integration and flow of data, more information is available to users, thus users can decide based on that information and they can be less prone to error. For example, when users want to use their annual leave, they can find all the necessary information on the ERP system without the need to ask their supervisor. By accessing the information, they can know available annual leave days and make informed decision.

ERP systems could be considered as the most difficult systems to be assimilated [2]. ERP systems are complex, need huge budget investment [1] and company re-arrangements and the implementation

success depends on different social, cultural and technical factors of the companies and countries [4].

According to [6], assimilation of ERP systems in organizations has been considered as one of the critical steps towards the realization of the intended benefits. Companies allocate huge amount of budget in order to gain the promising benefits of implemented ERP systems, thus effective ERP assimilation helps to achieve return over investment (ROI).

This paper begins with a brief literature review on the basic concepts of ERP system, benefits, implementation phases and factors that are considered in the process of ERP assimilation. This is followed by a case study illustrating the operation of ERP system in ethio telecom. At the end, the results of a questionnaire survey are shown and major findings are discussed. It also prioritizes critical success factors. The paper also proposes the ERP assimilation causal model.

2. Related Work

Researchers have been interested in ERP studies, but recently ERP assimilation in particular is the focus area of ERP researches. Along with the development of information technology, many companies implement ERP systems because ERP systems promise lots of benefits.

Implementing ERP systems in a company is not easy. One-third of ERP implementation projects are not successful and 60-70% of the ERP implementation cases failed in obtaining the expected benefits [20]. To realize the anticipated benefits after its implementation phase, an ERP system must be assimilated with a company's daily business processes in the post implementation stage. ERP implementation cycle consists of the following three phases.

- *Primary Phase*: A decision to implement ERP systems is made and the preparations of ERP implementation begins.
- *Secondary Phase*: Employees receive and start using the ERP system.
- *Assimilation Phase*: The ERP system has been able to diffuse to the tasks of the organization and has become a routine activity. ERP systems assimilation phase is defined as an extension of the ERP implementation phase in which the technology/ERP system is diffused to the work processes in the organization. In this phase, the use of the ERP system has become a regular activity in the enterprise.

The study in [20] is done on ERP assimilation and benefit realization based on Diffusion Of Innovation (DOI) theory. DOI is a theory that explains how, why, and at what rate new ideas and technology spread through cultures operating at the individual and firm level. DOI theory is considered suitable to be used in developing ERP assimilation model in this study. Because DOI helps to address the ways of assimilating new technology in an organization through analyzing organizational ways of working.

They formulated 7 hypotheses and the following are the accepted ones based on data processing result:

Hypothesis 1: ERP assimilation has a positive impact on the achievement of overall ERP benefit.

Hypothesis 2: Outcome orientation positively affects the success of ERP assimilation.

Hypothesis 3: Communication process positively affects the success of ERP assimilation.

Based on the result of analysis, the authors recommended that (1) organizations should be motivated to raise awareness in providing the best performance, (2) organizations should always distribute the latest information related to ERP systems, (3) organizations should integrate the ERP system with other applications used by the organization, (4) utilization of ERP systems in the organization's operational activity should be enhanced because with the absence of the need to use ERP systems in day-to-day operations, the ERP system will not be used, and (5) actualization of data in the ERP system should be improved by always

inserting new data into the ERP system, so that the user can use the data of the ERP system in real time.

According to [20], the influence of ERP assimilation on ERP benefit realization was examined. The result shows that ERP assimilation significantly influences overall ERP benefit. This study also examined the influence of 6 antecedents on ERP assimilation and found that outcome orientation and communication process influence ERP assimilation process significantly.

Kouki, *et al*. [19] identified some determining factors of ERP assimilation and they explained that the worldwide popularity of ERP system is because the software application could improve business efficiency and productivity and streamline operations. Deep and extensive assimilation of the system in an organization is the key in realizing these benefits.

According to [19], there is limited research about ERP post implementation and ERP assimilation. Similarly, no research investigated ERP experiences in developing countries. Based on a qualitative research methodology grounded in the diffusion of innovations theory, the paper aims at investigating the factors that would promote EPR assimilation. A comparative case study analysis of six firms in a developed and a developing country suggest in both contexts the primary factor for supporting and encouraging a successful ERP assimilation. Other factors such as training and education, IT support, organizational culture, managers' and users' involvement and strategic alignment were also identified that foster ERP.

Bonner and Chae [12] revealed that, while there is a rich body of literature on ERP adoption and implementation, there is limited research on the post-implementation effects of ERP assimilation on process agility, business intelligence maturity, and innovation. They hypothesize that ERP assimilation is positively related to business process agility.

According to [8], as ERP systems are deeply embedded in the business processes, diffusion and routinization of ERP systems in organizations rise as well. Business process agility is related to the ease and speed with which firms can reconfigure, redesign and realign their processes to respond to new needs, threats, and opportunities. Through the mediation of business process agility, ERP assimilation is positively related to incremental innovation performance as firms with strong process agility can respond to customer needs and improve operational flexibility and customer retention. A high level of agility can be manifested in increased product customization, improved delivery performance, and reduced response time to meet new customer demands. The author also revealed that, despite a rich body of literature on ERP adoption and implementation, they do not adequately understand the post-implementation effects of ERP systems on process agility, Behavioral Intention (BI) maturity, and innovation.

3. Methodology

This research is a qualitative type case-based exploratory study focused on ERP assimilation of ethio telecom. In this method the researcher provides a description of the behavior that comes from interviews and other sources, such as observation [13]. The client also reports details of events from his/her point of view. Moreover, this type of research method is considered for this study because of the following reasons and justifications. First, this type of research aims to identify key issues and variables and it is suited to exploration of issues in depth. Hence, the results of a case study of some organization and context can be extended and applied to other similar organizations and contexts [4]. The case study research design is also useful for testing whether scientific theories and models actually work in the real world [14]. This study assessed ERP assimilation in ethio telecom and identified critical success factors of ERP assimilation. TAM (Technology Acceptance Model) is used as a reference in order to investigate those factors. Interviews, document reviews, group discussions and

observations are used to extract the necessary information which help to assess the ERP assimilation in the case company.

4. Theoretical Framework

This study uses two theoretical models in order to assess the constructs. These theories were used as a reference frame in order to investigate the ERP assimilation success factors and to come up with the proposed model. According to [15], depending on the type of research design, the role of theory varies. For instance, the case study research method intends to survey how an issue is discovered through one or more cases within a bound. In a case study, a particular individual, program or event, for instance, is deeply and thoroughly studied in a specific time [15]. Unlike other qualitative research designs, it is argued that the case study research needs identification of the theoretical perspective at the beginning of the investigation because it affects the research questions, analysis, and interpretation of findings [15]. In other words, "the complete (case study) research design embodies a theory of what is being studied drawn from the existing knowledge base. In this respect, attention is paid to the role that theory plays in a research design and falls into the domain of methodologies or theoretical perspectives [15].

4.1 Technology Acceptance Model

TAM's usefulness and perceived ease of use determines an individual's intention to use a system with intention to use serving as a mediator of actual system use [8]. It is one of the most widely used theories in Information Systems literature. The two beliefs (perceived usefulness and perceived ease of use) predict attitudes, which in turn influence intended use of a technology. This intention consequently influences behavior of actual system usage. Perceived usefulness is the degree to which a user thinks a technology would enhance performance or productivity in the workplace and it is also seen as being directly impacted by perceived ease of use. Perceived ease of use is the degree of lack of effort required by the user in adopting a given technology [9]. According to TAM, one's actual use of a technology is influenced directly or indirectly by the user's behavioral intentions, attitude, perceived usefulness of the system, and perceived ease of the system. TAM also proposes that external factors affect intention and actual use through mediated effects on perceived usefulness and perceived ease of use [11]. Figure 1 shows the technology acceptance model as demonstrated in [9].

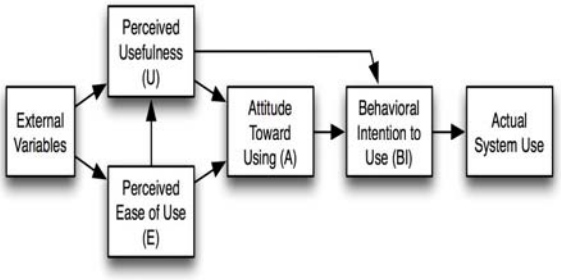

Figure 1: Technology Acceptance Model

According to [17], user acceptance is defined as the demonstrable willingness within a user group to employ information technology for the tasks it is designed to support. Thus, the designers or procurers are not applying to situations in which users claim they will employ it without providing evidence of use, or to the use of a technology for unintended purposes (e.g., using the Internet for personal entertainment in a work situation) [17].

TAM is a robust but parsimonious theory and it is useful to explain a particular information system or technology [16]. Therefore, many studies have proposed extended models for revising Technology Acceptance Model [16]. According to [16] learning the critical role of TAM can guide researchers to design different user interfaces for different online customers, and consequently achieve high user usage in different application areas.

4.2 Interference Theory

Interference theory is a popular and well-studied theory of forgetting and this theory's cliques are categorized into two encampments. One camp supports the changed trace hypothesis - that is a

memory trace is altered by subsequent information resulting in forgetting of the initial stimulus. The second camp supports the multiple-trace hypothesis, in which a memory trace is created for each stimulus, but having multiple similar stimuli interferes with the retrieval of the correct stimulus. For this study, we took the first camp which is the changed trace hypothesis as its optimistic side. The changed trace hypothesis is also called Retroactive Interference Theory. Retroactive interference in particular involves unlearning. When retroactive interference occurs, we not only learn new information, but we also may unlearn the previous information.

The need to use Interference Theory is that the researcher believes that highly sticking with legacy system leads users to resist for new technologies and ideas. Thus, unlearning the existing work processes and philosophies could contribute for high assimilation results. Not decommissioning legacy applications is one of the common mistakes done by organizations during ERP implementation. According to [18], "If organizations do not actively work to decommission applications during implementation, the end result is an ERP with all of the original legacy applications hanging off of it". The end result is another piece of software that one is paying maintenance and support on, paying for hardware and upgrades, and paying for interfaces back into the core ERP, when the point of getting an ERP system was to streamline workflow and reduce costs and waste.

4.3 The combination of TAM and Interference Theory

Grounded on the above model and theory, we assumed the combined model as shown in Figure 2.

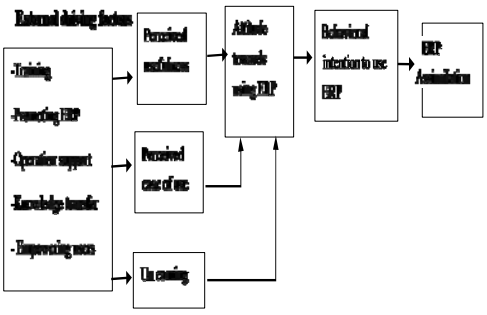

Figure 2: Assumed ERP Assimilation Model

5. Findings

This study confirmed TAM to be a useful theoretical model in helping to understand and explain ERP assimilation. According to the assessment based on TAM model, most of the respondents agreed that the ERP assimilation in ethio telecom was successful.

Table 1: Pearson's Correlation between ERP Assimilation and ERP Assimilation Factors

		Assimilation
PEU	Pearson Correlation	0.224
	Sig. (2-tailed)	0.159
	N	41
PU	Pearson Correlation	.555**
	Sig. (2-tailed)	0
	N	41
UA	Pearson Correlation	.564**
	Sig. (2-tailed)	0
	N	41
BI	Pearson Correlation	.587**
	Sig. (2-tailed)	0
	N	41
UL	Pearson Correlation	.587**
	Sig. (2-tailed)	0
	N	41
Assimilation	Pearson Correlation	1
	Sig. (2-tailed)	
	N	41

The results in Table 1 show that the correlations between factors and Assimilation have a Pearson value of r = 0.555, r = 0.564, r = 0.587 and r = 0.587 for variables of Perceived usefulness (PU), user attitude (UA), BI and unlearning (UL) variables respectively. They all have a strong association and integration with the dependent variable Assimilation. PU, UA, and UL significantly influence ERP assimilation. Yet, TAM's perceived ease of use (PEU) has lower association with r=0.224 that is found to be statistically insignificant and BI is excluded from the proposed model. Another interesting result of the study is that both forgetting the existing system and being efficient on the new system have undeniable role in affecting users'

attitude towards ERP and behavioral intention to use ERP.

Hence, theory of interference is involved here in its positive side in order to justify enabling employees to stick with the new system and take all the anticipated benefits can be a result of totally detaching from the legacy system which is against the productivity of the case company. In Korea, people are encouraged to use IT in every field to catch up with the social change caused by IT [11]. We believes that it is important to learn from such an experience and organizations need to encourage their employees to use the implemented system and to be beneficial. The results also exposed that the employees' perceived usefulness is high in ethio telecom and this created good chance for assimilation and also it is reasonable to consider that this may be because a significant number of sampled individuals are masters holders and hence are aware of corporate applications and how better to use the systems. Therefore, this has implication for effective ERP assimilation in ethio telecom.

This case study has attempted to identify the critical success factors of ERP assimilation. Based on the data from interview, group discussions, questionnaire, observations and document review, this study has identified critical success factors of ERP assimilation and proposed the ERP assimilation model based on the results. The study revealed that commitment of top management in scheduling training, effective knowledge transfer, promoting ERP system, good operation support, and quality control and feedback are external factors which affect ERP assimilation.

This study has also identified somewhat new idea of assimilation, which conceptualizes that unlearning an existing trend positively contributes to reach optimal assimilation level.

6. The Proposed Model

TAM and Interference Theory were used as theoretical lenses to assess ERP assimilation in ethio telecom. The theory and model give a guide to identify factors that facilitate ERP assimilation. Figure 3 shows the proposed model which is derived from the two models.

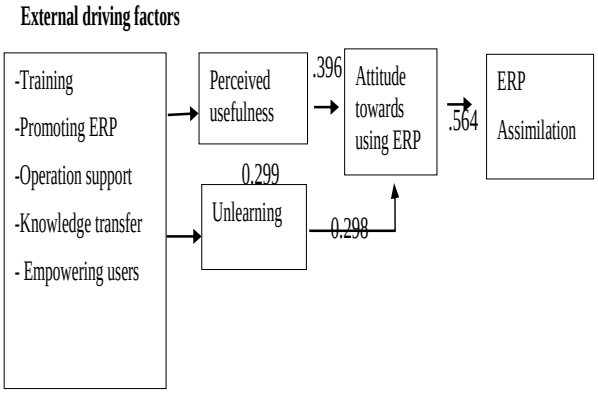

Figure 3: *TAMI ERP Assimilation Model*

The TAMI assimilation model is developed based on four constructs that are Perceived Usefulness (PU), Unlearning (UL), User Attitude (UA), and ERP assimilation.

Perceived usefulness (PU): is the users' perception that the ERP system would improve their work efficiency. PU directly influences users' attitude of ERP use and it indirectly affects ERP assimilation. PU is influenced by other external factors such as training, promoting ERP system, operation support, UL and empowering users.

User attitude (UA): is a judgment of an ERP system by users, which can be positive or negative. In the current study, user attitude is directly influenced by perceived usefulness and unlearning and it influences ERP assimilation. Users' attitude determines their choice of action or their readiness to use ERP.

Unlearning (UL): is to make an effort to forget the usual way of doing something so that one can learn a new and sometimes better way. Unlearning of the existing old-fashioned and inefficient system positively influences the user's attitude of using ERP system. So this could create effective ERP assimilation.

ERP Assimilation: is the degree in which an ERP system is immersed in its users and serves individual users as well as the company at its optimum. It is

dependent construct which is influenced by perceived usefulness, user attitude and unlearning.

In addition to the three constructs, TAMI assimilation model allows to describe additional single potential factors which seem minor, but that build the major factors.

7. Conclusion and Future Work

ERP is capable of increasing a company's performance. However, the rate of ERP system failure to get benefits is very high among organizations which implement an ERP system.

Implementation of ERP projects within schedule and on budget does not imply that organizations are realizing the benefits of ERP system. Before an ERP system becomes important to an organization, it has to be routinized and embedded in each business activity. This study proposed a model based on Interference Theory and Technology Acceptance Model that is used to assess the factors that contribute for successful ERP assimilation. As the model is based on two theories, it gives a better picture for managers and practitioners to identify what factors affect ERP assimilation in their organization. This model can also be used by other similar organizations. Therefore, the recommendations of this study can be generalized and extended to be applied and shared by other organizations in Ethiopia with similar contexts and environments. In addition, the research can be used to contribute to related researches.

The following are future research works:

- Different scientific theories and models should be used to conduct such kind of behavioral study and they may give better result with integration.
- Multiple case studies of ERP assimilation should be conducted in Ethiopian organizations to strengthen the findings of success factors.
- Researches on ERP assimilation especially on Return over Investment (ROI) of ERP system implementation are required.

The following are recommended.

- Being organized and resourceful to deliver timely training and the transparent knowledge transfer process is recommended.
- Other Ethiopian organizations planning to implement ERP system can consider the success factors identified in this study as input for managing their ERP project.
- ethio telecom can also use this study as post project lessons assessment.
- The proper and independent ERP operation support is necessary to make the system operational and to be well assimilated.
- Empowering users and promoting the new system helps to develop behavioral intention to use the new system, which is shown weakened in this study.

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