Development of a Conceptual Model to Support ERP System Selection in Developing Countries

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Abstract. Enterprise Resource Planning (ERP) systems have been heavily adopted in developed countries in the past decade and most studies on ERP adoption and selection focuses on these countries. With the emerging trend of ERP adoption in developing countries, the crucial question is: How to select an adequate ERP system. Of course this is not a new issue and already discussed in the developed countries, but many of the available studies are highly focused on this setting. Developing countries can actually adopt the available selection models but the suitability of the models has to be approved in the context of these countries. This proposal, therefore, intends to indicate the methodology to be followed in analyzing the suitability of the existing selection models in order to come up with a prototype of a suitable ERP system selection model for Ethiopia's context.

Keywords: ERP, ERP selection, ERP selection framework, ERP selection Model.

1 Introduction

Enterprise Resource Planning (ERP) system is an integrated set of programs that provides support for core business processes, such as production, input and output logistics, finance and accounting, sales and marketing, and human resources. An ERP system helps different parts of an organization to share data, information to reduce costs, and to improve management of business processes [2]. According to Wier B. and his colleagues [37], ERP systems aim to integrate business processes and ICT into a synchronized suite of procedures, applications and metrics which goes over firms' boundaries. In order to be more efficient, many companies rely on extensive use of IT, often by installing ERP systems [23]. There are reports of ERP systems providing benefits such as cost reductions, improved productivity, better managerial decision-making, and facilitation of process or structural change [29, 5, 17, 12].

ERP take-up has been much lower in developing countries (DCs), with estimates that they make up some 10-15% of global ERP sales [15, 25]. However, developing countries look set to become the locus for a major expansion of ERP implementations [22] and accordingly the adoption rate is also increasing [1]. In line with the inclining

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adoption rate of ERP in developing countries, a comprehensively systematic selection policy for ERP systems is very important for the success of ERP projects [30].

ERP software selection is tedious and time consuming due to the complexity of the business environment, the limitations in available resources, the complexity of ERP software and the diversity of ERP alternatives [36]. Therefore, ERP system selection is crucial in the early phase of an ERP project. In addressing this concern, several models have been developed to support the selection of ERP systems. The earliest proposed software quality model is the McCall model [21]. There were a conceptual model for ERP package enhancement and a six-stage model to evaluate ERP software [28, 34]. The fuzzy analytic hierarchy process (FAHP) model, which is developed by Shing-Ko & Chi-Tai 30], is one of the models for ERP selection. This model works by considering software quality characteristics; besides it can also solve the multi-criteria decision making (MCDM) problems and facilitate group fuzzy MCDM process [30]. The ERP selection model by Wei, & Wang [35] classifies the selection attributes in the categories of project factors, software system factors and vendor factors.[35]. Lin [19] and Luo & Strong [20] studied the ERP evaluation models for universities. The ISO 9126 software quality model is also incorporated in the ERP selection model developed by Shing-Ko & Chi-Tai [30].

The models, mentioned above, are developed by considering certain situations and evaluated in areas where the models are developed. The FAHP model by Shing-Ko & Chi-Tai [30] considers management aspects in Taiwan. Two empirical cases in Taiwan, company A and college T respectively, belong to different industries were also conducted to prove the practicality of the proposed FAHP model. This implies that in order to use such models in different situations, context based suitability analysis should be carried out. National culture also has a crucial impact on the selection and adoption of ERP systems [16]. This research, therefore, intends to access the suitability of the available ERP system selection models in the context of developing countries, like Ethiopia, and will customize or develop a new suitable model for Ethiopian context.

The main topics will be discussed in the following five sections. Based on the problem definition in the next section, the objectives of the study will be defined in section 3. The 4th section will show the methodology followed by the expected results of the study. Finally beneficiary groups will be introduced.

2 Statement of the Problem

Several studies prove that SMEs in a number of developing countries are largely benefited out of appropriate ICT adoption [4]. It is also obvious that information system investments can bring substantial benefits to companies. On the other hand, there are also many risks involved and possible failures can cause serious problems. To ensure appropriate decisions, the strategic effects of IS investments should be taken appropriately into account [24]. Companies expect to get several kinds of benefits from information system (IS) investments. However, there are also serious risks involved. Failed IS investments can even threaten the functioning and existence of the whole company and it is even true in the case of large, company-wide systems,

such as ERP software. Therefore, appropriateness of such system should be ensured by comprehensively systematic selection policy [30].

In recent years ERP software vendors have increased their focus on small and medium sized enterprises (SMEs). Oracle small business suite (OSBS) and SAP Business One, Business by Design or Business All-in-One initiatives by SAP are examples of this trend. Furthermore, there are a large number of international vendors specialise in ERP software for SMEs together with a large number of domestic ERP vendors. There are a number of issues that have encouraged the interest of ERP vendors towards SMEs. These include the saturation of the market as most large enterprises have implemented ERP software, electronic commerce benefits from close integration between large and small enterprise systems (e.g. through supply chain integration or B2B eCommerce syste. The high number of SMEs compared to the number of large enterprises, and the technological development together with the availability of relatively cheap hardware confirms this trend [13].

The spreading of ERP applications is also reaching into developing countries. Some businesses in developing countries have already implemented or are in the process of implementing ERP systems. Researches undertaken by different institutes [10, 26, 31, and 32] approve this fact. In paving the way to ERP adoption, several studies should be conducted indicate measures that should be taken in the ERP adoption and selection process in developing countries. Existing ERP commercial packages cannot provide a once-for-all business model for every process of all industry. Thus, no single ERP packaged software can meet all company functionalities or all special business requirements [27; 33; 14]. Therefore, companies must choose a flexible ERP system and a co-operative vendor that is responsive to customer needs.

There is no systematic and suitable evaluation framework in place when most companies in developing countries evaluate ERP systems. In addition, ‘‘ERP vendor hype’’ further complicates the selection process. Decision makers frequently adopt the common ERP evaluation criteria as the measures without developing tailor-made objectives and clear requirements that echo the company characteristics, its position in its competitive environment, and its corporate strategy. The result is an inevitable delay of ERP implementation and under-performance of the system. Hence, an ERP system selection framework is extremely critical in assisting executives to evaluate from the perspective of company strategies [9].

As the adoption rate of ERP systems increase in developing countries through time, suitable selection frameworks will be crucially demanded by corresponding companies. As in any other developing countries, companies in Ethiopia are also using trends of others in the ERP system selection process which might lead them to failure. So at this early stage, developing an ERP system selection framework is a timely response for the emerging ERP adoption trends and will also address the problems most companies are facing in the ERP system selection process. One way of coming up with ERP system selection framework can be through evaluating the existing frameworks against specific contexts and making the necessary adjustments or changes to bring the framework fit to the specific context. That can also be considered as suitability analysis followed by customization or changes to develop a context based ERP system selection framework. As such studies are not conducted in Ethiopia context; this research will gear towards filling the knowledge gap and addressing the problem companies are facing.

3 Objectives of the Study

The major objective of this study is developing a framework which will be used in supporting the tedious and time consuming ERP system selection by considering Ethiopia's context. Companies will save time, effort and money which they might expend through the time consuming ERP system selection process and in operation time. In doing so the following specific objectives will also be addressed:

- Creating depth understanding on the existing frameworks
    - As the study basis on existing frameworks, suitability of the frameworks for Ethiopia's context will be analysed and the analysis will help for depth understanding of the frameworks.
- Developing a quick reference
    - In conducting the analysis detail comparison will be carried out between the models and this will be used as a quick reference to understand the similarities and differences of the models.
- Filling the knowledge gap
    - There is no study on ERP system adoption in Ethiopia. Therefore this study will take the lead and will address the adoption coverage and will also determine specific characteristics to be considered in developing ERP systems for companies in Ethiopia. This will contribute to the knowledge domain by stipulating the specific characteristics to be considered in developing ERP systems for countries like Ethiopia.
- Easing vendors effort
    - Local or international ERP system vendors can use the result of this study as a reference and the criteria list will help them to fit their product to Ethiopia's market.
- Opening the door for further studies
    - The adoption of ERP systems is far behind from developed countries. Not only such big and complex systems but also the basic ICT adoption in Ethiopia is also lagging behind. But determining the reasons and initiating the potential companies for appropriate ICT adoption is an issue which requires further study. This study, in addition to the crucial problem it is aiming to address, will open the door for further studies.

4 Methodology

The whole research process to be followed in this study is represented by a flow diagram as given below (Fig 1.)

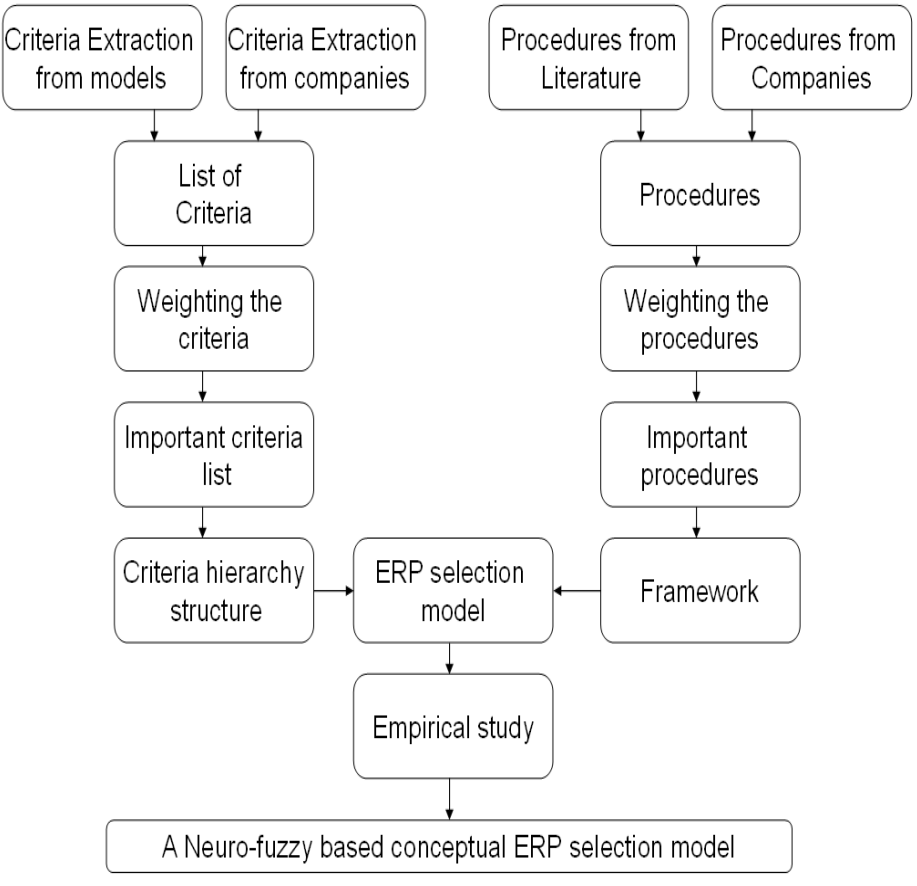

Fig. 1. ERP selection methodology

The study will begin by identifying the available ERP system selection models. The models should be those which have got acceptance by the scientific community. Depth study will be carried out on each model and extracting the detail list of selection criteria out of the models will follow.

The criteria used by companies in Ethiopia which have implemented or are on the verge of implementing ERP system will be gathered in parallel. The companies will be any of manufacturing, service or business companies and include both SMEs and Large Enterprises (LEs). Based on the available literature review and deep interview with companies, additional important criteria will be identified. According to different studies, when implementing an ERP project, price and time are both the most important factors, besides; the vender's support is also a crucial issue [18]. Except the investment cost of ERP project, the annual maintenance cost and human resource cost are also the potential expense for organizations [8, 7]. Wei & Wang [35] sift three categories of attributes to select an ERP system including project factors, software system factors and vender factors. Everdingen et. al.[11] explored that software system

and supplier are the major criteria which contents 10 sub criteria for selecting an ERP system. Bernroider & Koch [6] even found that the priorities of criteria are different between small-medium sized company and large sized company. Therefore, during extracting additional criteria, such recommendations of literatures and the reflections of companies will be considered. These additional criteria and the criteria used by companies will formulate the important criteria list to be considered when selecting ERP systems for companies in Ethiopia. The same procedure will be followed in determining the important steps to be considered in the selection of ERP systems.

Having the criteria and procedures, a neuro-fuzzy based conceptual model will be developed. Most of previously developed models works based on analytical hierarchy process (AHP). In this study a neuro-fuzzy based approach is adopted to test the applicability of neuro-fuzzy systems in the multi criteria decision making environment. Finally the practicality of the model will be tested by conducting an empirical study.

5 Expected Result of the Study

Design science research should addresses important unsolved problems in a unique or innovative way, or solved problems in a more effective or efficient ways [3]. As a design science research, this study will address the specific problem in an effective and efficient way through the model to be developed. Therefore, the most expected result of this study is a model to support an ERP system selection process in Ethiopia's context. Hevner et. al [3] also stated that the key differentiator between routine design and design research is the clear identification of a contribution to the active knowledge base of foundations and methodologies. The researcher believes that the unique criteria to be identified and the enhanced model to be developed will formulate the contributions to the knowledge domain out of this study.

Apart from the above mentioned main outputs, the comparison between the available models will also be additional contribution that can be used as a reference to get a quick understanding of the available models.

The criteria used by SMEs and LEs will be compared so that vendors will take specific criteria into consideration when developing ERP systems for SMEs.

6 Beneficiaries

The primary beneficiaries out of the result of this study are companies which want to implement an ERP system. ERP software selection is tedious and time consuming due to the complexity of the business environment, the limitations in available resources, the complexity of ERP software and the diversity of ERP alternatives, [35]. Therefore the model will support companies to make decisions in selecting an appropriate ERP system.

The study conducted by Alemayehu & Arjun [24] revels that vendors include many criteria that were not considered so important by the case companies. Therefore, the evaluation criteria perceived important by the client companies will be disposed for

local or international vendors and they can use it in developing ERP systems for the specific market.

There is no study on ERP system adoption in Ethiopia. Therefore this study will take the lead and address the adoption coverage and will also determine specific characteristics to be considered in developing ERP systems for companies in Ethiopia. The scientific community will be benefited out of the specific characteristics determined, and the enhanced model, together with these specific characteristics, can be considered as contributions to the knowledge domain.

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