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Fuzzy modeling Enterprise Resource Planning tool selection

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Abstract

ERP tool selection can be seen as one of the most relevant decision-making stages for an organization. This task is conceived as being one of the most difficult ones when an organization is trying to acquire an ERP tool. This work proposes structuring the decision-making selection of ERP tools. With this purpose, we have applied a Fuzzy Cognitive Map based approach capable of offering a definitively organized and structural outline in the acquisition of an ERP tool. Also, this proposed model offers a selection model where the more relevant criteria, their intensity and the relationships between them are identified.

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1. Introduction

Enterprise Resource Planning (ERP) tools have complex decisions associated with them, not only in the pre-implementation stage but during the actual implementation as well. An ERP tool allows for the complete integration of information flow from all functional areas in an organization [12] by means of a single database [25].

With respect to the decisions associated with pre-implementation, the parties in charge of an organization must make difficult and relevant decisions. These could be deciding what software to use, defining correct policies, taking action for the carrying out of structural and cultural change, as well as the planning and implementation of strategies, among others.

This research is focused on one of these decisions: the ERP tools selection. The decision-makers see this selection as completely saturated by a wide range of factors which they must shuffle. In addition, the decision-makers must make a relevant effort to understand what the most relevant criteria are, in order to complement the decision-making process. In this sense, it is useful and efficient to determine the complexity of a problem, along with the structuring, as it offers the decision-maker a set of different possibilities by means of a clean and outlined form, in addition to helping identify factors and relationships.

Our objective is to propose an accessible model for the selection of ERP tools by means of a model whereby the factors that influence the decision, as well as the relationships established among them, are specified in such a way that the model offers a methodology for selecting among different ERP tools.

Specifically, we propose a selection model where the more relevant criteria, their intensity and the relationships between them are identified. In this context, the Fuzzy Cognitive Map (FCM) technique has the potential of reaching an innovative proposal for selecting ERP tools which improves the existing both "de facto" and international standards. Also, using the FCM technique we can observe the significance of each factor and its influence on the final decision. This is not possible with current practices.

The literature related to the selection of ERP tools is scarce. Most of these studies carry out contributions on methodological proposals for selecting an ERP tool, besides providing elements that are used as selection factors [53,54]. We highlight the research by [54] due to the similarity of the objectives, but with notable differences in the technique applied and the results. The research that we propose has allowed us to measure the importance of each factor with regard to other factors without considering the rest of

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the relationships. In this way, we seek to obtain a framework for selecting ERP tools, where the relationships between the factors and their relevance are defined. In this sense, we want to contribute a practical selection method so that the organizations can select the most suitable ERP tool.

In the second section we analyze the decision-making process that takes place during the selection of an ERP. Here is where the decision for the selection of an ERP tool takes place. Next, in the third section the research methodology will be explained and the factors that influence the decision of adopting and implementing an ERP tool, as well as the critical relationships between adoption and implementation will be identified. Furthermore, we will establish the sign as well as the intensity of the relationships. Lastly, the results and conclusions reached in this research will be shown, as well as the limitations and future research lines.

2. Background

The complexity of the decisions that must be adopted in the pre-implementation and implementation stages of ERP tools is derived from the complexity itself of those tools [1,17], [26,36,38,41,46,50,51,55]. However an ERP tool carries relevant advantages and benefits for an organization [20,56], for example, offer a faster access to information and an improvement in the supply chain through e-commerce integration.

Three organizational requirements are established for the successful implementation of an ERP [37]. The first being a possession of a clear business objective; second, understanding the nature of change, and the third an assuming of project risks. Other aspects related to the application, such as change management, selection of an ERP tool, cooperation with the software vendor, tool implementation and analysis of its viability [53] are added to these previous factors.

Due to this group of factors, we consider that the model designs which outline the decision-making throughout the preimplementation and implementation phases are not only useful but also necessary [57]. Nevertheless, it is quite difficult to appreciate the adequate construction of the related models as a consequence of the complicated task of selecting the criteria. We can, however, assert that the development of these models offers a rational approximation of the decisional process and can interpret processes as complex as the selection of an ERP tool.

In addition, ERP tools differ from traditional Information Systems and Technologies (IS/IT). A traditional IS/IT is capable of almost completely adapting itself to the characteristics of the organization [34,35], nevertheless, ERP tools incorporate the possibility of making only minimal adaptations. For this reason, it is possible to claim that the decision to implement an ERP tool is not exclusively a technological initiative, but, on the contrary, factors of organizational nature also influence the decision-making of the ERP selection [3,19,40].

In this sense, when a company begins a process that heads toward the implementation of an ERP tool, in most cases this process stems from a perception of benefits [20,56] that are derived from the incorporation of an ERP or the need to improve the current IS/IT (Fig. 1). Also, we can claim that, in general, the incorporation of an ERP tool in an organization is considered an opportunity [19], motivated by important advantages associated with these tools, aside from the threats derived from the risks that are assumed in this type of project.

This last stage would be initiated with the identification of a group of IS/ITs that are capable of covering the need or perception. Below, diverse IS/ITs are evaluated with the purpose of selecting the most relevant ones [13,14,18], so that they can then be compared to the alternative of acquiring an ERP tool. This group of processes is considered a key when deciding whether or not to implement an ERP tool.

Once an organization has opted for implementing an ERP tool, the following stage is the choosing of an ERP vendor. It is recommended that the group of tasks that compose this stage are developed by a steering committee [24,48,49]. The committee's work begins with the search for ERP vendors and is conditioned by factors such as the project cost or the organizational size.

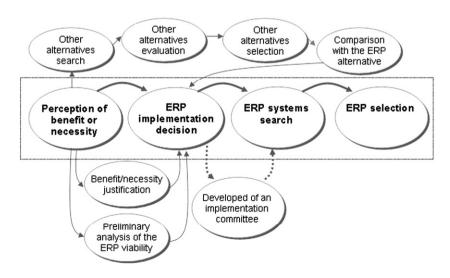


Fig. 1. ERP implementation decision processes.

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