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How to choose the most suitable ERP for an SME: the ERP-SSM methodological proposal

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Abstract: The globalised and dynamic economy in which current business activity takes place requires business decision makers to obtain the best management information in order to be successful in their business strategies. Enterprise resource planning (ERP) is one of the key technological solutions to obtain this valuable management information, based on the unification of the data that circulates through the different administrative processes of the company, and thus guaranteeing the coherence and integrity of the information. One of the most important decisions of small and medium enterprises (SMEs) is the choice of the most suitable ERP for them, on which the success of the implementation of the ERP and the benefits obtained from its use depend to a great extent. This research paper proposes the ERP-SSM scientific methodology to guide SMEs in the process of choosing the most appropriate ERP in each case.

Keywords: ERP selection; selection methodology; SME; small and medium enterprise; ERP; enterprise resources planning; management information systems.

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Vicente Guerola-Navarro has developed his professional career as a researcher since 2016, having published articles in JCR-level journals in all its quartiles, several of them in Q1. He has also published several Scopus level studies,

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1 Introduction

The enterprise resources planning (ERP) systems have been being a key factor in business development. In its continuous evolution, they have evolved from being a mere working tool, to being a competitive and strategic element, even arriving to generate new business models based on their development (Laudon and Laudon, 2015). Therefore, they have been studied from different points of view, such as its implementation and the factors that may influence it, as well as the effects that it may have on the company, comparisons between different systems from different manufacturers, or its evolution throughout of time, among others (Mahmood et al., 2019).

ERP systems are in a continuous process of improvement, and are a fundamental factor in the evolution of companies towards Industry 4.0 (Oztemel and Gursev, 2020), with the companies that develop these systems dedicating a large part of their resources to research, development and innovation. ERP systems, along with other business management systems such as Customer Relationship Management (CRM), have become the great pillars in the management of key information for business decision-making in the pursuit of business excellence (Gil-Gomez et al., 2020).

ERP systems can be considered as the consequence of the evolution and sophistication of inventory management systems during the last sixty years (Gil et al., 2010). As a result of this evolution, ERPs arise, which are systems capable of managing in an integrated way the information and knowledge of all the processes of a company, from the most primary ones, such as, for example, those related to accounting, purchasing, sales, production to other secondary (although equally important) as those related to human resource management, cost management, quality, etc. (Grabot and Botta-Genoulaz, 2005) ERP systems are, therefore, a communication platform between all areas of the company, which can achieve greater efficiency through their exploitation. But they are also systems capable of connecting to each other and transferring information automatically, with the consequent saving in costs, time, errors, and with the availability of online information at any time (Oltra-Badenes et al., 2019a). In this way, ERPs can not only improve the internal functioning of an organisation, but, well implemented and exploited, they can improve the company's relationship with its environment, and may even increase the efficiency and responsiveness of a company. supply chain (Møller, 2005).

Obviously, not all ERP are the same, they do not have the same characteristics in terms of modules, options, functionalities, costs, implementation complexity, usability, etc. There are many ERP systems on the market, and they are focused on different types of organisations based on different characteristics, such as, for example, their size, their investment capacity, the activity they carry out, or the economic sector to which they belong. In fact, there are specific ERP systems for specific sectors. These ERPs are known as 'vertical' or 'sectorial' (Oltra-Badenes et al., 2019b).

Therefore, taking into account the significant investment that an ERP implementation project entails (Efe, 2016), and that in many organisations, ERP systems are the information engine that allows the execution of business processes (Cunha et al., 2016), the selection of the appropriate ERP software for a specific organisation, with its particular characteristics, is an extremely critical decision for that organisation. However, many organisations, especially small and medium enterprises (SMEs), in most cases lack adequate knowledge to make this selection. To facilitate this decision-making and, above all, to be able to make the decision in the most appropriate way, a methodology is required that proposes step by step the activities to be carried out.

The main objective of this paper is to design a methodology that can serve as a guide for selecting ERP systems in SMEs. To do this, an analysis of the scientific literature on the selection of information systems and more specifically ERP systems has been carried out, and subsequently the information from the theoretical study in the business environment has been contrasted, interviewing consultants for the implementation of systems ERP, as well as companies that have implemented these systems and recognised experts in the sector. After compiling and analysing all the information collected together, and based on it, the following section proposes the ERP-SSM an 'ERP System Selection Methodology' for selecting ERP systems focused on SMEs.

2 Literature review

In order to propose the methodology presented below, different works on the selection of ERP systems and the steps to be followed for this have been previously reviewed. In this literature review, there are many studies that focus on identifying and analysing the critical success factors in the implementation and use of ERP (Vicedo Payà et al., 2020). These criteria can be used as a starting point to establish selection criteria for ERP systems (Gupta and Kazim Naqvi, 2017), although there are also studies that focus on identifying specific criteria for the selection of ERP systems (Keil and Tiwana, 2006; Esteves and Bohorquez, 2007; Mexas et al., 2012) or more recently (Hamidi, 2016).

It should be said that most of the studies carried out regarding the selection of ERP focus on the use of various techniques to evaluate ERP systems based on the requirements and expectations of the company, trying to endow it with the most quantitative nature possible to the decision. In this line, you can find works based on methods such as TOPSIS (Çakır, 2016; Efe, 2016; Niu et al., 2017) QFD (Karsak and Özogul, 2009) or ANP (Aya and Özdem, 2007; Liang and Li, 2008; Kilic, 2015). But it can be said that, in this line of studies for the evaluation of ERP solutions, the most used technique is the AHP method (López and Ishizaka, 2017).

It is also important to highlight that the majority of works focus on the selection of ERP systems from the point of view of large companies or business sectors (Lin et al., 2011; Verville and Halingten, 2002; Yang et al., 2007; Cebeci, 2009, Das and Dayal,

2016). But in none of the cases is there talk of a vertical or sectoral ERP system (Oltra-Badenes et al., 2019b).

However, in all these studies, emphasis is placed on one or another part of the selection model, on some of the activities or phases, and especially on the evaluation part, as already indicated. But no proposed methodology is appreciated that includes all the necessary activities with a minimum level of detail so that the entire process can be carried out. For example, the SHERPA methodology (Sistach et al., 1998), despite being a specific and highly detailed methodology, does not comment on the project team and the profiles that must participate in it, in addition to having functional criteria that could be updated to the current situation. In the case of Bradford (2016), his proposal begins directly with the analysis of requirements, without considering previous steps. In the cases more focused on the use of multicriteria decision-making methodologies (MCDM), the work focuses on the comparative valuation between alternatives, although they do not indicate any activities such as the work team, analysis of previous requirements, product demonstrations, visits or negotiation, among others. Pérez–Salazar et al. (2013) make a very interesting literature review and propose in their work a series of activities to carry out to select an ERP based on the different phases identified in various works. But her work focuses more on the bibliographic review, and a methodology is presented in which each activity is entered in little detail, going directly from the constitution of the work team to the analysis of requirements and criteria to be evaluated. Nor does it propose a method for evaluating and comparing the different alternatives. Therefore, it does not become an operational proposal for an SME.

In the research presented in this paper, all the information from these revised proposals was collected, as well as from the works cited, and contrasted with the experience of experts and companies using ERP, which evidently had to have selected previously the system. The expert panel was made up of two profiles. On the one hand, academic specialists in the area of information systems, and on the other, professionals, consultants and managers of implant companies and manufacturers of ERP systems. With this, a panel of 10 experts was composed and the Delphi method was used, one of the methods that is best suited to address constantly evolving scientific fields, such as the one investigated here, mainly to detect key factors in the management of Information Systems, and predict their future evolution (Luna Huertas et al., 2005).

Based on the proposals of the aforementioned research, and the contributions and experience of the experts and companies using ERP systems that have been included in this research, a series of activities are proposed that must be carried out sequentially as methodology for the selection of an ERP system. In this case, it is not being done from the point of view of a large company, nor from a strategic level, as is often the case in the reviewed studies, but rather from a point of view of the needs of an SME, and at an operational level.

3 ERP-SSM: Methodological proposal for the selection of an ERP system

First, and before starting to apply the ERP selection methodology, the company or organisation that wants to implement it should ask the following question: Is the organisation ready to implement an ERP? Implementing an ERP system is far from installing new software, or as another IT department project. It must be taken into account that it involves a strategic and organisational change that will affect the entire

company and that it will require a project that involves the entire organisation, which must be ready for change, driven by the highest management. If not, the project should be directly discarded and perhaps choose another alternative, such as custom development (internal or external), integration of area-specific software packages, maintenance of existing systems, etc.

If the answer to this question is affirmative, and the company is prepared to undertake a change of these characteristics, the first thing to do is select the ERP most appropriate to your situation and particular characteristics, for which it is proposed to follow the methodology made up of the activities presented in Figure 1 and described below in the following sections.

Figure 1 Proposed methodology (see online version for colours)

Source: The authors

3.1 Create a work team to select the ERP

Once the decision is made to implement an ERP, the first step should be to form a project team. It is important to emphasise at this moment that the team referred to here is not the ERP 'implementation' team. The implementation team will be formed later, at the start of the implementation phase once the selection has been made. At this point it is a question of establishing the team of the "ERP selection project", which obviously must have members in common with the implementation one, but which does not have to be the same. The ERP selection project team should be led by senior management and should include representatives from all departments at the highest level, as well as functional experts from the different processes. Obviously, a technical point of view is also necessary, but it should not be forgotten that the implantation of an ERP system involves in itself a process reengineering (Bradford, 2016) and, therefore, must be taken into account from this point of view, and not from a merely technological aspect.

Sometimes, it is interesting to include in the team the figure of an external advisor. But you have to be very careful about it, since these external consultants, and the companies that are dedicated to this type of work (there are companies and organisations that advise on ERP selection projects) are usually aligned with some system, product or a specific implementing company, often even being the advisory company itself.

However, this figure can be very interesting as a component of the team, since the members of the project team of the organisation in which the ERP is selected do not have to be experts in this type of system (and generally they are not) And a specialised professional vision, such as that of an external consultant, can be very valuable. But in its proper measure. The adviser should not make the decision in any case, it is simply a source of information and knowledge, an opinion from an external and expert view, which can be considered.

On the other hand, it should be noted that senior management cannot delegate their leadership role to the project. It is important to emphasise again that it is a strategic decision, not a technical one, and as such it must be undertaken. This is one of the main problems when selecting an ERP for an SME. Usually, being a technological system, the selection of ERP is usually left to technicians. But that should not be so, because many points of view are necessary for a decision like this, and technique is just one more vision to consider, and generally, not the most important.

3.2 Collect relevant information from ERP systems

At this stage, the selection project team must collect relevant information about ERP systems in general, and the situation of the sector and the market.

Possibly the team is not an expert in this type of systems. But if a project of this magnitude is going to be tackled, they must begin to become it, training in the basic concepts (and the not so basic) of ERP systems. For this, you can get a lot of information about ERP systems, projects, benefits, disadvantages, risks to take into account, etc. and through specialised books, professional magazines, conferences, exhibitions, yearbooks, the internet and other sources.

The project team must organise to know everything necessary before beginning the ERP selection process, since, once implemented, this will be the tool that manages all the information in your company, and will become a critical factor for its success and future

development. Therefore, all the time that is used to train the project team, and which makes it capable of selecting the most appropriate ERP, will be well spent.

In this section, it is also remarkably interesting the help of a possible external advisor, expert in the matter, who can provide information and training, provided it is in a non-partisan or interested way. And not only in terms of ERP systems only, but also in the different areas that may be necessary for the implementation and use of this type of system, and the possibilities they offer at the time of selection. For example, in the possibilities of the different cloud modalities that can be used, the free software options that exist, the different types of implementation, etc.

3.3 Identify the strategic objective and the basic characteristics of the project

Sometimes, the fundamental reason for the ERP implementation project is not defined or is not adequately known by the team. However, this is a fundamental point that, if it is not clear and duly transmitted at the time of making the selection, can lead to a totally erroneous selection, based on criteria not appropriate to that fundamental reason. For this reason, a specific point is specifically dedicated to this activity in the proposed methodology, due to its importance.

Therefore, the purpose of this step in the methodology is to establish the strategic objective, the real reason for the decision to implement an ERP. In a large company, in general, when this step is reached, this is more than defined, from the decision to undertake a project like this, and then it is finalised and transmitted to the selection and implementation plan, as seen in many published research papers. But in an SME, this is not so clear, and many times it is not really known why you want to implement an ERP, what is the goal of that journey.

Different companies may adopt an ERP system for entirely different reasons, including but not limited to, from technical and commercial reasons, to impositions by dominant partners or members in a supply chain. The initial rationale for adopting an ERP system influences the definition of the problem, the definition of the objectives, the methods to achieve those objectives and the rest of the subsequent activities.

It is not the same to implement an ERP due to the need to face a legislative change in an accounting issue that the existing system cannot cover, than due to the need to establish a new working model in logistics management, or due to obsolescence. technique of current systems. Obviously, the project approach is quite different in each of these cases, and the ERP to be selected may also be.

In this step, problem identification and definition techniques can be used, such as Toyota's 5W (or 5 why), which despite being remarkably simple, can greatly clarify this issue (Liker, 2006).

And at this point, it would possibly be interesting to reflect again, based on the result obtained, if the company really needs an ERP to achieve that "fundamental objective". In addition, once all the information collected so far, both internal and external, is known, it is a good time to reframe the question "is the organisation really ready to implement an ERP?"

If this is the case, the entire project team must assimilate this strategic objective, and all the activities of the selection project (and subsequently its implementation) must be established based on it, without losing sight of it as a point of reference to which it must reach.

Once this strategic objective has been defined and assumed as such by the entire project team, and after processing and assimilating the information obtained in the previous phase, it is possible to identify some basic characteristics to find the most appropriate solutions to the organisation's limitations and its resources. At this time, reference is made to very global characteristics, such as whether you want the ERP to work in SaaS mode, or in your own installation in the same company, or if access to the source code is necessary or desirable. These are issues that, depending on the project and its strategic objective, can be taken as selection criteria in later steps of the methodology, but that, sometimes, based on the strategic objective of the project, such as the elimination of the IT department. They can be a fundamental point to consider before even thinking about the detailed objectives of the project, which are identified and structured in the next phase.

3.4 Establish and structure the objectives of the project

Once the reasons for the ERP implementation are known, and the strategic objective based on them, the project team must identify and define the objectives that are expected to be achieved by using the ERP. These objectives can be diverse and of variable magnitude and importance. Furthermore, they are surely related to some extent to each other. Therefore, it is interesting to establish a structure that can relate them.

Structuring the objectives implies organising them, so that the project team can describe in detail what the company wants to achieve by implementing the ERP, and then incorporate these objectives appropriately in the decision model.

The strategic objective must at all times guide the final objectives that the project team must strive to achieve; therefore, these objectives also serve as a mechanism to harmonise the opinions of different people within the project team. Many times they are lost sight of when going into detail of the particular objectives, for example, when establishing the objectives to be fulfilled by the system at a functional level in a specific area or department of the company. If you do not contribute to the strategic objective, through the objective structure, it is surely not very important. Therefore, all objectives must be aligned to achieve the strategic objective and will be systematically structured based on it.

Two methods can be used to establish the hierarchy of the fundamental objectives of the ERP system, such as descending decomposition and ascending synthesis. In the top-down decomposition procedure, the project team discusses "What do you really mean by that higher-level goal?" The answers reveal the fundamental lower level objectives, which help to achieve the higher-level objective.

Alternatively, the project team can start from lower-level objectives by asking, "What more general objective is this aspect of?" to find a more general objective and advance upwards using the ascending synthesis procedure. The upper levels in the hierarchy refer to more general objectives, and the lower levels contain more detailed elaborations of the higher objectives.

It is important that the established objectives have the characteristics proposed by Doran (1981), who used the word SMART (intelligent) as a mnemonic rule of the following characteristics that an objective must meet:

- S: Specific
- M: Measurable

- A: Attainable
- R: Relevant
- T: Time-Related.

3.5 Rank the objectives according to their priority

After creating the structure of objectives, the project team should prioritise them, determining which ones are totally necessary to achieve the strategic objective, and which ones are desirable, but with a lower priority. It must be remembered that resources are limited, and that many times it is not possible to achieve all the objectives due to budgetary problems or time limits. But the minimum objectives must be met to achieve the strategic objective of the project, and therefore, there will be some more important than others.

Based on this prioritisation, it is possible to already identify relevant attributes to evaluate ERP systems. Both quantitative and qualitative attributes that satisfy the company's strategies and objectives should participate.

3.6 Perform the requirements analysis

The analysis of requirements is a fundamental step in this type of project, which will allow us to know the needs of the organisation to carry out its processes, and which must be covered by the ERP. Therefore, it is at this moment when the detailed requirements are established that the ERP system must meet, taking into account the established objectives.

For this, a detailed knowledge of the processes carried out in the company is essential. Many times this is the most complex selection step, especially in the case of SMEs, since, in general, they do not have documented processes, and it is complex to do the requirements analysis. In fact, on many occasions, the processes are not even identified. Therefore, in the first place, the processes will have to be identified, defined and modelled, if this is not already done.

Sometimes, due to its size and the possible complexity it may take, this step is a 'subproject' of the main project, focused on Process Management. In many occasions, this step is not given enough importance, and it is about analysing the specific needs that the ERP system must have, based on the 'ways of doing' of the company, but without taking into account that they cannot being the correct ones, or the most suitable ones. Therefore, it is important to question the suitability of the company's processes and act accordingly.

Once the processes are perfectly identified, defined and modelled, a requirements analysis can be made, using standard requirements analysis tools, such as the use cases proposed by the Unified Modeling Language (UML) language or the structure of the IEEE/ANSI 830-1998 standard.

In general, the requirements will be functional, although these may lead to other non-functional requirements, rather technical in nature.

3.7 ERP systems market research

Based on the requirements established in the previous phase, the project team must search for ERP systems that are candidates to be implemented in the company. In general, in addition to taking into account the requirements, a filter must be established based on certain basic parameters (maximum affordable cost, platform, modules covered, etc.) and that is appropriate to the organisation and the type of project being proposed.

The project team should obtain the minimum sufficient information on each ERP that they can consider, applying the required requirements. This information can be obtained through different channels, such as initially through the internet and the official pages of ERP systems, consulting companies, universities, forums, industry and business associations, contact with other similar companies that have had a similar experience, or direct contact with the manufacturer or distributor of the ERP.

It may be the case that an ERP system is distributed and implemented by two (or more) consulting companies. This happens especially in the best known and implemented ERP systems. In that case, in addition to information about the ERP system itself, you should also look for information about the "Partners", the consulting companies that are responsible for implementation. Keep in mind that the success of an ERP implementation project depends more on the Partner than on the ERP itself.

3.8 Establish list of possible ERP systems

Once the information on the different ERP systems that may be eligible for selection is known, an initial list must be established, with a reduced number of candidates. It should be a small number, preferably between 5 and 8, according to Bradford (2016) and the SHERPA methodology.

Subsequently, the information on the ERPs selected in the first instance should be expanded, and a second filter should be established based on this to reduce the list. Here, the project team needs much more information about the ERP obtained in the previous phase. This information must be obtained through direct interviews with suppliers and partners, obtaining as many system data sheets, catalogues, papers, etc. as possible. All this information is contrasted with the requirements and objectives established to reduce the list of possible candidates.

Finally, the project team must select 2 or 3 (maximum 4) candidate ERP solutions.

3.9 Request for proposals

In this phase, you should request proposals for the ERP implementation project that have been included in the result list of the previous phase. This request for proposals must ensure that the scope, areas covered, deadlines, control milestones, etc. are reflected in writing of the project, as well as the costs broken down to the maximum level of detail, with the payment terms also included.

In the proposals, the costs must include the entire implementation project, complete, including both software and hardware, consultant or programmer hours, the software licenses and their possible updates. In the software section, it should be borne in mind that sometimes, in addition to the specific ERP software, other types of software are required for its proper functioning, such as database management systems or

development tools. And of course, it should also include future maintenance, both in support or development services, and in license updates.

In addition, possible developments should be closed as much as possible to solve the possible 'GAPs' that may exist between the ERP processes and the company's requirements. No company fits 100% with an ERP, and many times, if not always, it is necessary to make developments or modifications to the system, even if they are minimal. The developments that may be necessary to cover the identified requirements must be perfectly defined and budgeted.

It is also highly recommended that the proposal requested from suppliers include information from the project team that will participate in the implementation if their proposal is selected. This information must include the structure and composition of the team that would participate, their CV and experience in ERP implementations in companies with similar characteristics, and guarantees to ensure that this project team will be stable and truly the one that will take charge of the project throughout its duration. On many occasions, the ERP implementing companies present project teams made up of people, consultants, who later are not the ones who carry out the implementation for different reasons (for example, that the consultants have been assigned to another project, or that have left the consulting company). It must be ensured that the person can change, but the profile that will be in charge of the implantation must be similar.

3.10 ERP demonstrations

At this point, the ERP suppliers that have been selected in the previous phase must show their products, their ERPs, so that their validity to carry out the company's processes is clear. This demonstration should be done in one session for each ERP in which they are present: the selection project team, senior management, mid-level management (directors or department heads) and a selected group of future end users. The goal here is to gain a much deeper understanding of each solution, specifically its functionality and adaptability to the organisation.

It is essential that the company, for the demonstration, has identified its main processes and the characteristics of each one, in order to observe how the ERP system to be shown can manage these processes. It is also very interesting to provide a dataset to the company that is going to do the demonstration, so that it is already done with data that is as real as possible, and that those attending the demonstration get an idea of how the ERP could work in an environment.

If necessary, you can demonstrate an ERP in multiple sessions. For example, by functional area, so that the department managers and end users can go by turns only to the session in which they see how their needs will be covered.

Of course, the information extracted from each of the demonstrations must be collected, both in the technical aspect of the ERP and in response to the consulting team.

3.11 Analysis of adequacy of ERP to business

Once all the demonstrations have been carried out, the project team gathers all the information and opinions to review the adequacy of each ERP to the list of requirements.

If there are doubts as to the adequacy of the system to the company and vice versa, you must resolve them, either by contacting the ERP company, or the consultant that will

implement it, or internally, depending on the origin of the possible doubt. But the adequacy of each ERP to the processes and requirements of the company must be clear.

It is interesting in this case to use comparative tables to collect the adequacy of the ERP to the requirements. Furthermore, these tables can be used to make comparisons between different systems.

3.12 Visits to reference companies

In this step, the aim is to observe how the ERP to be evaluated works in a real environment. For this, visits are made to companies in which each of the ERPs have been implemented and are working. Obviously, it is interesting that the company that is visited has requirements that are as similar as possible to those established, and have characteristics (in size, sector, geographical area, etc.) that are as similar as possible.

If possible, it is also highly advisable to make the visit without the company of the consulting company, so that the interlocutors of the reference being visited can express their opinions completely freely. Although that is difficult in the vast majority of cases.

3.13 Comparative evaluation of ERP (AHP method and basic criteria)

At this point, you already have all the information from the different ERP systems and the consulting companies that implement them. Now it is necessary to compare the options, to decide.

This decision is based on multiple criteria, which are not always the same or with the same importance for each organisation. It depends on the established objectives, the associated requirements and how each one of them is covered in each ERP. Therefore, the decision is very complex and differs in each case, making a tool or method that helps decision-making very useful, bearing in mind that it must be able to take into account different criteria and priorities among them.

In the scientific literature there are many studies on the application of different methods for the selection of software packages. Specifically, Jadhav and Sonar (2009) conducted a study on the evaluation and selection of software packages that includes a systematic review of methodologies for selecting software evaluation packages and techniques. This study concludes that the application of the 'Analityc Hierarchy Process' method (better known as AHP for its acronym) to the evaluation of software packages has been successfully applied in many research studies.

In fact, the AHP method has been applied on different occasions to the selection of an ERP system, but from the point of view of large companies and multinationals and based on selection criteria appropriate to them. Possibly this is because ERPs have in the past been directed at large companies. However, currently ERP manufacturers are seeking to expand their customer market, approaching and adapting to the SME market (Ferran and Salim, 2008), and it is in this type of company that the methodology presented in this work, ERP-SSM.

It should be said that the AHP method was presented by Thomas Saaty (1990) and has been widely used as a multi-criteria decision-making tool in areas as diverse as Society, Science, Education, Economy, Transport, Location and Allocation of Resources,

Marketing, Production, Environmental applications, Urban planning, Public Sector, Health, Systems evaluation, Group decision, Resolution of international conflicts, New Technologies, Thought and Ethics, among others, as can be seen in Vaidya and Kurnar (2006).

The potential of the method is since it adapts to different situations, its calculation is simple, and it can be used both individually and in groups. In the case of the proposed methodology, ERP-SSM, this is essential, since it is mainly focused on SMEs, and the adaptability and simplicity are essential for its use. It can be stated that the AHP method is a method of selecting alternatives (strategies, investments, etc.) based on a series of criteria or variables, which are usually in conflict. To do this, weights both the criteria and the different alternatives, using a series of paired comparison matrices and the Fundamental Scale for pairwise comparisons. Thus, the AHP method allows a systematic comparison of alternatives and is applicable to practically all decision-making areas (Saaty and Vargas, 2006).

The central principle of AHP is to divide the decision problem into a hierarchy of sub-problems, thus structuring the decision, which makes it suitable for handling complex decisions (Saaty, 1990).

In this way, the decision problem is first broken down into a series of hierarchical sub-problems or decision criteria, each of which can be analysed independently in relation to each alternative. Obviously, in this way, the complex multi-criteria decision is broken down into decisions based on a criterion, being easier to understand and analyse.

In the methodology presented in this work, the use of the AHP is proposed as a tool to compare the alternatives and decide, based on the established criteria, the most appropriate option.

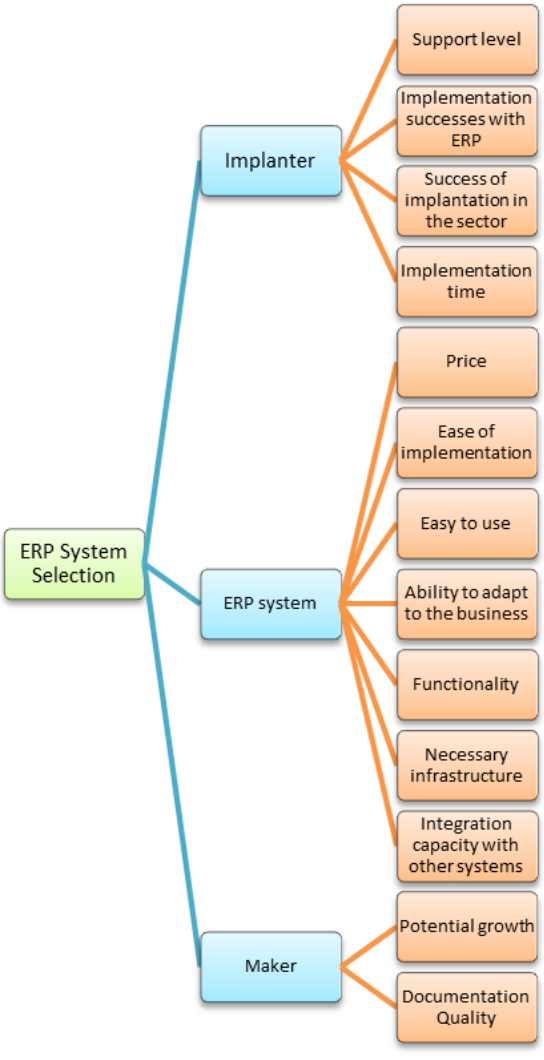
Therefore, it is necessary to establish the criteria to be applied in the AHP method, as well as their relationships and relative weights. This, obviously, is extracted from the objectives and their structure and priority, as well as from the previously established requirements. Of course, not only do ERP characteristics, the software itself, come into play in these criteria, but criteria must also be considered in relation to the software manufacturer and the implementing partner or company, many times more important in the success of the project than the ERP itself.

A classification of criteria extracted from the works of Wei et al. (2005), Tsai et al. (2012), Hamidi (2016) and Cruz-Cunha et al. (2016) is presented below, which in turn study the existing literature in this regard. These criteria were agreed with the group of experts, and they were also presented to a group of 15 managers/CIOs of companies that had recently selected and implemented an ERP system.

After that, as a result, the ERP-SSM methodology establishes a series of basic criteria that SMEs can consider in the selection of the ERP system. It should be said that, in this proposal, the criteria are structured in 3 categories, either relating to the ERP System, its manufacturer, or the partner or implanting company. The classification into 3 categories that is presented in the ERP-SSM methodology and that can be seen below in Figure 2 is not observed in any of the published works.

These proposed criteria can be adapted depending on the needs of each of the companies that apply the methodology, which must also establish the relative importance weights of each one, depending on the requirements of each specific case.

Figure 2 Basic criteria hierarchy (see online version for colours)



Source: Self made

3.14 Discussion of results

At this time, there is already an evaluation result of each ERP, the result of all the information collected on each system, and its comparison with the specific requirements of the company, to achieve its objectives.

This result must be analysed by the project team and by management. It may be that there is an error of assessment, or in the establishment of criteria or requirements. Even if there is still some unsolved question, or it has not been sufficiently documented. This is the time to review all of those issues, before moving on to the next phase of negotiation with the selected provider.

3.15 Negotiation

Finally, you have a decision on the most appropriate ERP. Once the ERP has been selected (or the combination of the ERP and the consulting company, if applicable), the project team negotiates the contract with the selected ERP provider. Here you should review the entire future implementation project again, including planning, phases, resources, costs, etc. Finally, senior management gives final approval, of course with the approval of the project team, and the contract is signed with the ERP provider.

In this negotiation phase, it is possible that, based on it, some parameters of those considered in the selection process will change. It is frequent that some suppliers, if they have not been selected, can 'reformulate' their project proposals, especially in the economic area, or in terms of time and dedication of resources. If this is so, it is necessary to return to the phase of 'Comparative Evaluation of ERP' and modify the necessary values to obtain the decision based on the new situation.

These negotiations can be quite extensive, and may even modify the decision, if the values of the selection criteria are really modified. It should be borne in mind that, in general, the time spent by ERP providers to provide information, resolve doubts, carry out demonstrations and visits to reference companies is quite a lot, and many times, it is profitable for them to modify costs or deadlines execution, to finally obtain the signature of the contract, and not lose the client against the competition.

3.16 Final decision and signing of the contract

Finally, the ERP decision to be implemented is made, and the contract is signed. With this, the implementation project can begin, depending on the established planning.

4 Conclusions

To obtain the expected benefits in the implementation of an ERP system, it is essential to select an ERP system appropriate to the needs of the company in which it will be used. For this reason, during the last decades, the problem of selecting ERP systems has been studied. But these existing studies in the specialised literature are made from points of view that do not quite fit with the needs of SMEs, either because the focus of the study is for a large company or multinational, or because the scope of the study does not cover the entire process, taking into account each of the activities that must be carried out, from start to finish, with the operational requirements that an SME may have.

With the aim of being able to provide SMEs with a methodology that allows them to select an ERP system in a simple and operational way, in this work a proposal has been made for the ERP-SSM methodology, which can be used in an SME for the selection of an ERP system suited to your needs.

The proposed methodology is based on different existing proposals regarding ERP system selection methodologies. The information on these proposals has been verified with a team of experts in the field, made up of academic specialists, consultants and companies that use (and therefore have selected) ERP systems. The proposed methodology, in some way, groups and chooses the most detailed level in each phase of each one, to develop it and take it to a more operational level in an SME. In this way, a methodology is presented consisting of 16 phases, very specific and delimited each,

which make it very easy to follow, guiding the company that must make the selection from the first moment to the end of the process. In addition, some tools are proposed that can support some of these phases, such as the application of the AHP method, or the use of use cases.

Finally, it should be said that, as a future line of work, work is being done on the application of this methodology in the selection of ERP systems in SMEs in order to check their validity and extract possible improvements.

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