

The Use of Experts Panels in ERP Cost Estimation Research

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Abstract. This paper is an effort towards illustrating the use of expert panel (EP) as a mean of eliciting knowledge from a group of enterprise resource planning (ERP) experts as an exploratory research. The development of a cost estimation model (CEM) for ERP adoptions is very crucial for research and practice, and that was the main reason behind the willingness of experts to participate in this research. The use of EP was very beneficial as it involved various data collection and visualisation techniques, as well as data validation and confirmation. Beside its advantages, one of the main motives for using a group technique is that it is difficult to find a representative sample for a casual survey method, as ERP experts and consultants are rare to find, especially in the scope of SMEs' ERP implementations. It is worth noting that the panel reached consensus regarding the results of the EP. The experts modified and enhanced the initial cost drivers (CD) list largely, as they added, modified, merged and split different costs drivers. In addition, the experts added CF (sub-factors) that could influence or affect each cost driver. Moreover, they ranked the CD according to their weight on total costs. All of this helped the authors to better understand relationships among various CF.

Keywords: ERP; cost estimation; expert panel.

1 Introduction

As they say, "*it's about the journey, not the destination*", research techniques are very crucial for any research endeavour. They can lead researchers to the right path, or deviate them away from the desired destination. Moreover, the significance of any research results is determined by several measures, and the data collection and analysis techniques are on top of them.

In our proposed research phases, different data collection techniques are *used* and proposed. Some of those techniques are qualitative in nature, some are quantitative, and some are mixed approaches. The variety of methods chosen should help in identifying the different costs and factors that influence costs in the Enterprise Resource Planning (ERP) systems adoption processes, in order to establish a cost estimation model (CEM). In addition, these techniques should provide a multi-perspective on costs through involving various key stakeholders from beneficiaries, independent consultants, and vendors that participate in ERP adoption projects.

In particular, this paper discusses the Experts Panel (EP) approach that was used as a part of our “initial model development phase” (see fig. 2). The paper is an effort on arguing why *group discussions and interviewing* techniques are proposed in our initial exploratory research phase, and why we preferred the term “Experts Panels” over Delphi and Focus Groups (FG).

The remainder of the paper is organized as follows: the next section presents the research overview, researchers’ perspective of costs, followed by a description of the EP conducted. Moreover, a brief comparison between the EP and other related techniques followed by a conclusion.

2 Research Overview

In the next sections, scope, perspectives, and data collection are discussed.

2.1 Research Scope

As previously mentioned, this research focuses on identifying costs and the factors that influence costs within the adoption process in SME’s in order to develop a CEM. *Adoption* in this research starts prior to phase 1, and ends at phase 5 (see fig. 1). In other words, the focus starts with the cost drivers (CD) occurring during the feasibility study, consultant selection, vendor selection, contracting, etc till the Go-live phase. Post installation costs are often recurring within the ERP system lifetime. These costs are hard to take account of within this research. Thus, costs that occur after ERP installations are off boundaries of this research effort and maybe left for future research, yet the standard agreed-upon maintenance costs in contracts fall within this research’s boundaries.

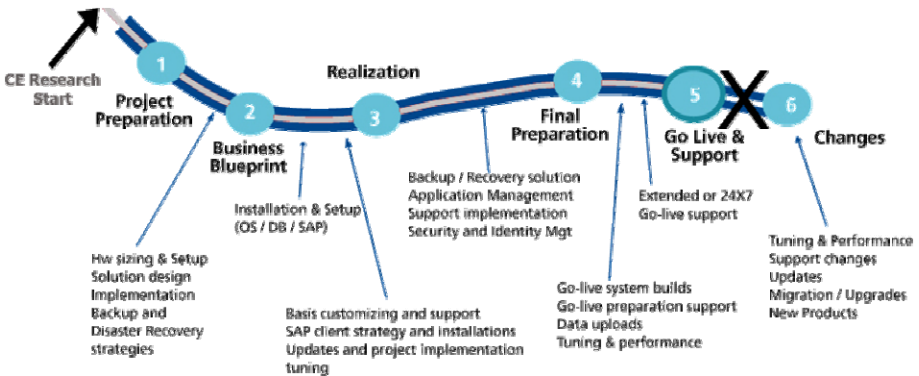


Fig. 1. SAP's accelerated methodology (ASAP) – Adapted from www.sap.com

2.2 Researchers’ Perspective (The Cost Lens)

This research is not concerned with cost/benefit analysis; it is more focused on the relation (or difference) between estimated ERP adoption costs with actual adoption costs of completed projects. The cost lens proposed in this research is because

sometimes benefits in relation to costs are not important or unattainable. For example, when an SME's budget is crossed, it does not matter how much benefits it will gain through dedicating more money to the project, as it might be out of the required resources already. In addition, benefits and their associated costs should be projected correctly from the beginning, as many companies implementing ERP systems filed for bankruptcy e.g. FoxMeyer Drug [1], [18], [21], and this was mainly due to a faulty ERP budget and schedule estimations [12], [13], [17]. Thus, in the previous example, the costs view is more crucial despite the potential benefits, as you can always gain more benefits when you pay more money, but it is all about your budget and your resources' availability. Moreover, the CEM should be used in order to project more realistic cost estimates, while benefits should be the motive for implementing an ERP in first place. Usually the expected benefits are the system requirements based on the requirements analysis included within the *request for proposal* (RFP) invitation.

2.3 Research Methods and Design

It is hard to predict the future without studying the past. Hence, this research will be based on data collected from EPs along with actual data from organisations that already completed their ERP adoption process. And this will be done through a multiple case study design, as it has more investigative recompense compared to single case study, as well as it provides a flexible approach for Information Systems research [3], [8], [32]. This research will apply a multi-method research technique, encompassing multiple case studies, empirical literature findings, EPs, documents analysis, interviews, as well as surveys. Furthermore, in order to build strong substantiation of constructs, data triangulation as a mixture of qualitative and quantitative data collection methods will be used [8].

To reach the goal of developing a CEM, this research project will tackle different research questions and aspects within the very domain of ERP cost estimation within SMEs. These aspects will require different perspectives, methods, and tools within its development cycle. After identifying relevant perspectives through inductive methods that can assist in identifying factors that influence costs and cost driver to be included in a priori CEM within phase one. Then phase two will start, and in this phase, an empirical test of the cost model will be conducted in order to identify the relative contribution of the different cost concepts in understanding the resulting costs of ERP adoption in SMEs. While phase one will be qualitative and inductive in nature, phase two will be deductive and quantitative.

This research will conduct multiple case studies. Fig 2 presents an initial map of the proposed research design. Within the initial model development, theory, literature review of empirical research and the researchers' experience will be used in order to develop an *a priori* CEM. In addition to that, several EPs with vendors, consultants, and beneficiaries are going to be held in order to direct the *a priori* CEM development into the right direction.

The theory to be used in this phase is the stakeholder theory (ST), which plays a role in identifying the stakeholders and cost associated with them in these ERP adoption process using its stakeholder identification instruments. Besides ST, the empirical findings and data collected will compliment ST in CD' identification. The *a priori* CEM will be used in the second stage as an initial guide for pilot interviews. Then an interview guide will be developed, and interviews will be conducted to the cases selected.

In the following stage, a mixture of qualitative and quantitative analysis will be undertaken. As the ST has a very good technique to identify stakeholders and respondents, still it lacks relevance to information and technological aspects. Thus, a complementary theory(ies) will be considered after this initial research step. The findings from the analysis are crucial, because they will be used in mapping candidate theories to these findings, in other words, an iterative theory relevance check will be conducted.

In case of not finding a relevant theory, a grounded approach will be an alternative for theory building from case study data as advised by [8]. After theory mapping or building, the research design will be modified to accommodate the chosen theory. Then a survey will be conducted followed by quantitative analysis.

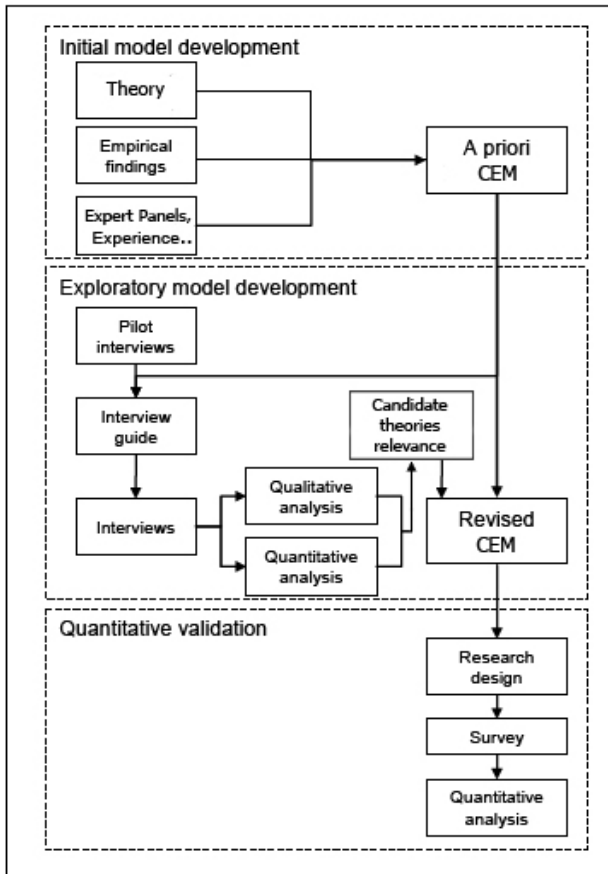


Fig. 2. Proposed research design: Adapted from [7]

2.4 Sources of Data and Data Collection Methods

In order to develop an effectual CEM, this research will collect actual data from the industry. The data required is as follows:

1. **Data** is based on finished projects.
2. **Data Sources:** Beneficiaries, consultants, vendors, and any stakeholder identified through the stakeholders analysis.
3. **Type of data:** Company size, industry type, cost factors (CF) and drivers (e.g. Business process reengineering, vendor selection costs, new hires, contracts, etc).

A further description of each data collection technique is as follows:

- a) **EP:** incorporates different techniques and data collection methods. The panels includes various key experts in the ERP adoption field, including consultants, vendors, and key project representatives from beneficiaries.
- b) **Interviews:** *semi-structured* interviews will be conducted with beneficiaries, consultants, and vendors, and guided by [19] ‘recommendations for qualitative interviewing’. The interviews will be carried out with diverse employee positions within the organisations in accordance to ‘triangulation of subjects’ strategy proposed by [26], and based on the initial interviewee’s sample plan identified by the stakeholder analysis.
- c) **Document Analysis:** analysis of project documentations including feasibility studies, project plan, project schedule, cost estimations, actual project expenses, as well as any documents recommended by the people involved in the project.
- d) **Surveys:** some are conducted as a part of EP in order to collect preliminary data about CF and CD within SMEs. Other proposed surveys will be conducted in order to get feedback on the adequacy of the *a priori* CEM developed.

3 The Experts Panel

Due to the implications of this research into practice, an EP has been conducted. The EP recommendations and insights would be very valuable to this research within its exploratory stage, as experts would provide more inputs that would help the researchers to understand the phenomena or the problem they are studying.

The EP serves as an initial research kick off, that will ensure the mapping of the researcher’s ideas and research problems with practice. Moreover, the EP is used as a mean of eliciting knowledge from ERP experts.

The panel included key persons involved in ERP implementations in Egypt. The participants were from the elite ERP consultants, vendors’ representatives and implementation project managers. The expertise of the participants represents “state-of-the-art” knowledge in a broad range of international companies and industrial sectors. Eight potential participants were contacted by phone and via e-mail, and eight experts responded and participated. The panel included vendor consultants from SAP, JD Edwards, Focus ERP, independent ERP consultants, and project champions and managers from different industrial beneficiaries. The variety of experts was to ensure that the researcher captures different views and perspectives on costs.

- *The Briefing*

Prior to the actual panel discussion, a research briefing was sent by email to participating experts. It contained information about the research, the panel setting, the research objectives, as well as the expected implications for practice.

- *The EP Discussion*

On the first panel meeting, an explanation (reminder) about the research objectives was provided. A set of presentations took place to explain the CEM, and what is needed from them in order to develop a model for estimating costs within the ERP adoption phase. Additionally, we illustrated the importance and need for such a model by beneficiaries, consultants, and vendors. Moreover, a less formal discussion was held at the beginning of the panel regarding their experiences with ERP projects in SMEs. Participants were asked predefined questions centred on the features of ERP adoption cost estimations within SMEs in Egypt, and its success rate of finishing projects at hand within budgets. Moreover, they were asked about the challenges facing implementers and costs' impact on ERP adoptions in SMEs. Some participants from major ERP vendors mentioned that they use CEMs to estimate budgets needed from beneficiaries to cover their part of costs, but they said that these models are not accurate, nor give a realistic view for beneficiaries about all the dimensions of costs needed for the whole ERP adoption project. One major note from several experts was that organisations regularly do not face cost problems in selection nor post-adoption phases, the majority of ERP problems and costs pop-up during the adoption phase, and that the research should focus and start with these costs.

- *The First Round*

In the first panel round, the participants were provided with an initial CD conceptual model (mind map). The initial mind map (fig. 3) was a visualisation of CF gathered through literature and researchers' own experience with previous ERP adoption projects. The visualising of CD and factors in a mind map (tree-like) format is believed to enhance the participants' insights and interpretations.

While the mind map was presented to the participants, group discussions took place and were managed by two moderators. One moderator's role was to ensure that the session advances smoothly, and the other's role was to ensure that all the topics are covered. Both of them were taking notes. The moderator had predefined list of questions for group interviewing, and these questions evoked the discussion and brainstorming among participants. The discussions were about which CD and factors should be merged or split, change their naming, CF' approximate weight on total costs, and their priority pertaining to SMEs, etc.

Although some debates on some specific CD' importance took place, the moderator reminded the group about the focus of discussion, and that they should adopt a *costs view* within an SME setting, and this minimised the level of debates between them. From our point of view, the discussion between participants was very fruitful, as it initially consolidated their views, and made the participants brainstorm together and start to provide valuable suggestions and remarks.

Further, each participant was provided with a questionnaire in a table (list) format that contained the compiled ERP costs. Their task was to verify if the listed CD were appropriate to build a CEM, and to ensure whether there are missing CD or existing ones that should be apart or combined, according to their relevance to the adoption process in SMEs. The questionnaire contained four main parts:

- 1) A list of CD;
- 2) A column to associate them with other CD that can influence these factors;
- 3) A column to CF according to impact on SMEs' ERP adoption projects;

4) A space to comment or add additional CD or factors that can influence these costs, which should be considered and were over looked.

The CD list was gathered through literature and the author’s personal experience in the field. This was to ensure the relevance of the data collected through research and experience in the field with practice. The questionnaire was a combination of open and closed ended questions. The open-ended questions were to help the experts provide their insights, recommendations or suggestions about which additional CF to include, exclude, combine, or split. The costs factors column contained cost items compiled from literature and researchers’ previous experience with ERP adoption projects. The cost items scale was from very high to very low in relevance to overall costs in an SME setting. The main initial CD were vendors, change management, business process reengineering, project management, hardware, software, human resources costs.

The participants’ feedback helped in further developing CD, adding new factors, merging some factors, decomposing some factors to include important sub-factors, and identifying CD that can influence other CF. This brought us to a better understanding of CD that should affect an ERP adoption process.

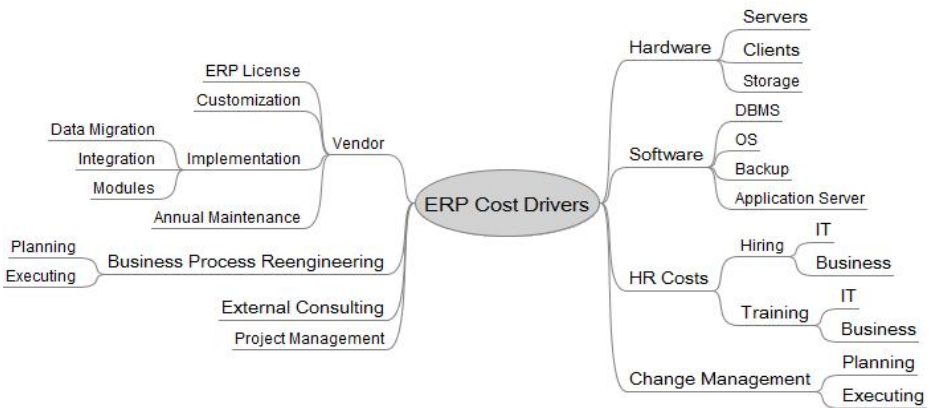


Fig. 3. Initial CD mind map

- *The Second Round*

In the second round, an updated list of CD was provided for participants. The list contained the new updated CF and drivers captured during the first round’s questionnaire, interviews, and discussions. The updated list was presented in a table format as well as a mind map. The moderator initiated a discussion about the comprehensiveness of this list, and this stimulated group discussions and interactions. During this round, the participants have agreed upon some slight modifications to the CF’ list, and the list was directly updated accordingly. At the end of this round, the participants were provided with the reviewed CF list and were asked to rank them *independently*. Their task was to re-rank the costs and to make sure that all the presented CF and our interpretations are complying with their suggestions and recommendations. The provided rankings of CD were: very high, high, medium, low, and very low. The participants

were alerted that CD should be ranked to their importance to the adoption phase within SMEs and from a cost perspective.

The data was analysed and showed that the experts has reached consensus. Moreover, the updated and consolidated mind map was sent electronically to the participants in order to confirm the validity of the CD presented. The updated mind map is in fig 4.

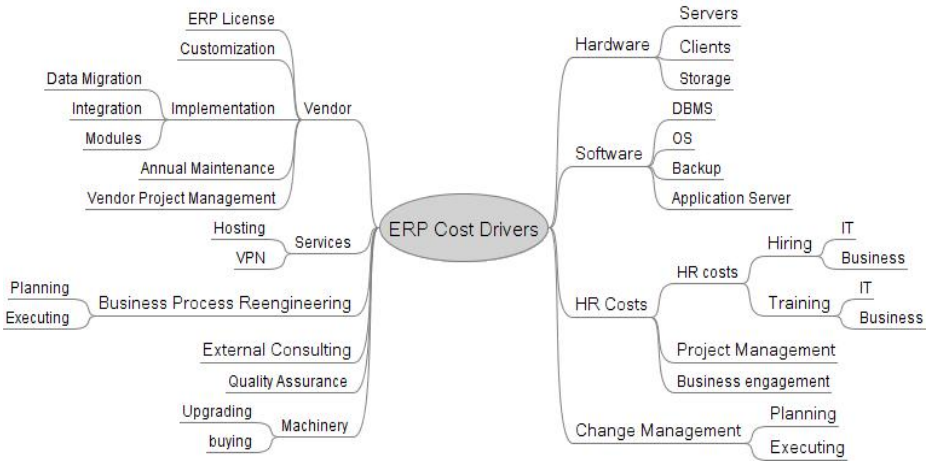


Fig. 4. Updated mind map

4 EP in Contrast with Delphi and FG Techniques

As researchers should choose the best method *they think* satisfies their research objectives, the method used and proposed in this research is a combination of several techniques. Although it is difficult to establish clear boundaries between the EP conducted in this research, and Delphi and FG, but WE will try in the following section to illustrate the main common similarities and differences between them. Part of this difficulty or confusion comes from literature itself, as the Delphi and FG studies have various variations which sometimes conflict with their own main principals, like incorporating fact-to-face group discussions in Delphi studies for example [5]. Moreover, while writing this paper, we have discussed it and consulted several colleagues in order to obtain their opinions about categorising the method used in this research. Some of them viewed it as a Delphi style research technique, and others viewed it more of FG research. These different views made me affirmative that the research technique used here is none of them; it is actually a combination of them whilst incorporating other techniques from other research methods as well.

As mentioned above, the next part will discuss the technical and conceptual differences between the EP in comparison with other “similar” techniques. In addition, we will provide arguments about why the technique used is more adequate than these techniques.

- Similarities and Differences

The EP technique used in this research shares similarities with Delphi, FG and NGT research methods. Although Delphi and FG techniques are considered data collection techniques through group interviewing or surveying, still they have basic differences.

- EP and Delphi

➤ *Similarities*

In literature, the Delphi method has been used to acquire knowledge from single or multiple experts [25]. The Delphi technique serves as a systematic method to collect ideas, opinions, and judgments on a particular topic at stake through the use of sequential questionnaires combined with feedback and summaries derived from previous responses [4]. The Delphi method is primarily used when the problem at stake does not suit itself with precise analytical techniques but can benefit from collective subjective judgments and opinions [16]. Moreover, one of the main goals of the Delphi technique is to reach consensus position from experts [4], [20]. Some Delphi studies use sound ranking measurement techniques (e.g. Kendall's W) through its iterations in order to measure the degree of consensus [2], [27].

➤ *Differences*

Although the above-mentioned characteristics and goals match with those of EP, yet there are basic differences between both techniques. The typical Delphi method is asynchronous and does not incorporate face-to-face interactions between participants or experts [28], as the anonymity of respondents is believed to give the method positive recompenses over face-to-face interactions [16].

In order to reach consensus, there have been rounds in the EP that are similar to those of Delphi; on the other hand, these rounds incorporated surveys, rankings, *plus* group discussions and interviews. Furthermore, the EP incorporated ideas and suggestions from the experts' group discussions, as group interaction and brainstorming would enhance the amount and quality of responses, and would initiate new ideas in contrast with individual brainstorming [22], [23] in [28]. Moreover, group interactions can be used to examine not only what individuals think, but also how they think and why they think that in a particular way [14]. In our point of view, face-to-face interactions are better when there is a group of experts that represents clients' side and vendors' side in order to decrease bias through objective discussions. In addition, group discussion would enable participants to exchange ideas and point-of-views, which would help in narrowing down and reaching consensus. Furthermore, Delphi presents data, key issues, and items in a *list* format to participants [2], [29]. On the other hand, during the EP rounds, lists and mind maps were used. Instead of presenting CF in lists only, mind maps were used to visualise information and to help participants grasp the full picture of the factors and the relationships among them. A mind map is an information construction tool represented as a graphical illustration of connections between concepts and ideas that are related to one core subject, and the process of constructing mind maps engages the participants with the content [31]. Mind maps are useful in situations where developing understanding, problem solving, brainstorming, delivering information, and evaluation of participants understanding are needed [31]. Moreover, mind maps are very similar to the notion of *cognitive maps*, which are used to record and graphically present qualitative data [6]. The mind map used was

dynamic; as we modified the map instantaneously according to their recommendations and suggestions to enable the experts to view the changes and re-evaluate them.

- EP and FG

- *Similarities*

FG is a qualitative data collection technique through conducting organised group discussions and interactions, moderated by one or more moderators. In addition, FG is a form of group interview that relies on communication between group participants in order to generate data [14]. The participants in this group are selected and assembled by researchers in order to discuss and reflect on, from their personal experiences, the topic of researchers' interest [24]. FG can be used at the initial or exploratory stages of a research [11], [15]. The chief purpose of FG research is to draw upon respondents' beliefs, experiences, and responses in a way in which would not be suitable using other techniques like one-to-one interviewing or questionnaires [10]. Moreover, several researchers have also indicated that group discussions can generate more significant comments than usual interviews [11], [30].

- *Differences*

FG are usually conducted in one rounds and do not capture comprehensive reflections from participants [9], on the other hand the EP was conducted in two rounds in order to reach consensus. In FG, data collection relies on the group interaction, interviews, and discussions solely, while in EP, those techniques were incorporated with surveys, mind maps, and rankings in order to ensure data validity and reliability. One of the core differences between the EP and FG is that, FG research is not considered a consensus oriented technique, and it is typically conducted in social research in order to observe the behaviour, reactions, and interactions among the group [11], [14]. On the contrary, the primary goal of the EP, was to reach *consensus* about the ERP CF and CD within SMEs.

5 Conclusion

This paper is primarily an effort towards illustrating the use of EP technique as a mean of eliciting knowledge from a group of ERP experts as an exploratory research. The developing of a CEM for ERP adoptions is very crucial for research and practice, and that was the main reason behind the willingness of experts to participate in this research. In our point of view, the use of EP was very beneficial, as it involved various data collection and visualisation techniques, as well as data validation and confirmation. Beside its advantages, one of the main motives for using a group technique is that it is difficult to find a representative sample for a casual survey method, as ERP experts and consultants are rare to find, especially in the scope of SMEs' ERP implementations.

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