IMPLEMENTATION OF THE DELPHI METHOD IN THE CHOICE OF AN ERP SYSTEM

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Abstract

The selection of a new ERP software package means a big commitment from organisations in terms of money and time as well as risks due to their complexity. Only a thorough and systematic selection of potential ERP implementation success factors can substantially increase the possibility that the selected ERP software and vendors will meet the true needs of the organisation.
This article looks at the process of planning the selection of ERP systems, based on the weighting of preferences from ERP specialists. However, the main difficulty lies in the agreement among the specialists on the utility factor of the selection criteria. To overcome this difficulty, the Delphi method was used where fifteen ERP specialists participated in a two-round Delphi survey. The first round was used in order to obtain a set of exclusive criteria for the selection of procurement system; while the last round was used to identify a statistical significance consensus on the weighing of the utility factors.

Περίληψη

Η επιλογή ενός νέου πακέτου λογισμικού ERP αποτελεί μεγάλο έργο για τις οργανώσεις από την άποψη των χρημάτων και του χρόνου καθώς επίσης και πιθανούς κινδύνους που αυτό συνεπάγεται λόγω της πολυπλοκότητάς του. Μόνο μια λεπτομερής και συστηματική επιλογή των πιθανών παραγόντων επιτυχούς εφαρμογής του ERP μπορεί να αυξήσει αισθητά τη δυνατότητα ότι το επιλεγμένο λογισμικό και οι προμηθευτές ERP θα ικανοποιήσουν τις αληθινές ανάγκες του οργανισμού.
Το άρθρο εξετάζει τη διαδικασία επιλογής των συστημάτων ERP, βασισμένη στη στάθμιση των προτιμήσεων των ειδικών ERP. Εντούτοις, η κυριότερη δυσκολία βρίσκεται στη συμφωνία μεταξύ των ειδικών για τον βαθμό χρησιμότητας των κριτηρίων επιλογής. Για να ξεπεραστεί αυτό το πρόβλημα και να επιτευχτεί ομοφωνία μεταξύ των ειδικών χρησιμοποιήθηκε η Μέθοδος των Δελφών. Συγκεκριμένα, στην έρευνα συμμετείχαν δεκαπέντε ειδικοί. Η έρευνα ολοκληρώθηκε σε δυο γύρους. Ο πρώτος γύρος χρησιμοποιήθηκε προκειμένου να ληφθεί ένα σύνολο αποκλειστικών κριτηρίων για την επιλογή του συστήματος προμήθειας, ενώ ο δεύτερος γύρος χρησιμοποιήθηκε για να προσδιοριστεί στατιστικά ο βαθμός χρησιμότητας των παραγόντων.

Keywords: ERP, criteria, utility factors, Delphi method

INTRODUCTION

The nature of today's business environment is particularly competitive and demanding, with the result that enterprises resort to the use of advanced information systems in order to meet the demands of the modern age. The most widespread information system used by companies is ERP (Rebstock and Selig, 2000). Many ERP systems are available on the market, each with different characteristics. According to certain researchers, a decisive factor in the choice of a suitable system is its successful implementation (Petroni, 2002; Somers and Nelson, 2001). As a consequence, many researchers have researched which criteria of an ERP system are the most important during the selection phase (Kumar et al, 2003; Bernroider and Koch, 2001; Hecht, 1997). Since the number of criteria resulting from the research is quite large, the result is a lack of consensus between the experts. In order to overcome this problem the Delphi method was used.
The Delphi method is a multi-criteria method which is used in support of the experts' opinions. The technique was first used in the 50s in the USA, initially for military purposes and later for defence research purposes (Dalkey & Helmer, 1963; Helmer & Rescher, 1959). The method became established and in the last few years has been used increasingly in the field of research (Matthews et al., 1979; Spivey, 1971). Its use is

considered imperative in complex, interdisciplinary questions involving new and future trends (Akkermans et al., 1999; Klassen and Whybark, 1994).
The method would be carried out in two rounds and pose a series of questions to a team of experts. The repeated rounds give the experts the possibility of assigning the appropriate significance to the factors of usefulness. Fifteen experts participated in the research. The aim of this article is to reach a conclusion regarding the most important factors of usefulness criteria in the choice an ERP of system.

BASIC CHARACTERISTIS OF THE DELPHI METHOD

There are five basic characteristics of the Delphi method (Loo, 2002; Mara, 2000):

- The composition of the team that will participate in the research.
- The anonymity of the team.
- The layout of questionnaires according to the method's cheques.
- It is a repetitive process, since it involves rounds.
- The existence of a form of analysis of the results, aiming at the reduction of risk of weaknesses that exist.

Some advantages and disadvantages of the Delphi method are presented in Table 1.

Table 1: Benefits and drawbacks of Delphi Method

ADVANTAGES	DISADVANTAGES
Consent of experts	Homogeneity of sample of experts
Anonymity Expression of opinions without fear	The experts must be willing to give the essential time and gravity to the research
Possibility of re-evaluation of opinions	Time-consuming process
Relatively cheap method, since it is carried out via computers	Maintenance of high quality of answers during the rounds
Feedback of research with new reflections	
Possibility of clarifications	

Sources: Bowles (1999), Sumsion (1998), Rudy (1996), Williams and Webb (1994), Jessup and Valacich (1993), Robinson (1991), Eden and Radford (1990), Nunamaker (1989), Reid (1988), Polit and Hungler (1987).

CHOICE OF EXPERTS

The positive outcome of the Delphi method is ensured on the one hand by the fair selection of the individuals who will compose the team participating in the research, regardless of the number of individuals who will finally take part. The following two speculations have occupied many researchers, such as Lam et al. (2000), Schmidt et al. (2001) and Brancheau et al. (1996). For example, if it is necessary for the experts to have equal theoretical and practical knowledge of ERP, as in the present research, then suitable participants must be chosen in order for the research to have a successful outcome.
For this reason, for the present research, the 15 experts who were selected to participate have as much theoretical as practical knowledge of ERP. The names of the research's participants are not recorded in order to ensure anonymity.

DELPHI ROUND ONE: IDENTIFICATION OF THE SELECTION CRITERIA

During the first round of the Delphi method, a questionnaire was sent to the experts that were selected to participate in the research. Initially, there was an introductory letter in the questionnaire that informed participants of the aims of research but also for which institution was being carried out. The experts were called to select from a list of criteria which they considered most important for the choice of a suitable ERP system. Specifically, a list of 15 criteria was given in the questionnaire for the choice of a suitable ERP system, which were a result of bibliographical research (Percin, 2008; Baki and Cakar, 2005; Kumar et al., 2003; Verville and Hallingten, 2002; Bernroider and Koch, 2001; Chen, 2001; Somers and Nelson, 2001; Themistocleous et al., 2001; Avshalom, 2000; Brewer, 2000; Everdingen et al., 2000; Illa et al., 2000; Mabert et al., 2000; Rao, 2000; Siriginidi, 2000; Sprott, 2000; Bingi et al., 1999; Hecht, 1997; Shikarpur, 1997). The experts were called on to select, in their opinion, the 10 most important criteria. Of course, it should it is noted that there was the possibility of criteria being included which were not on the proposed list

but that which they themselves considered important. Appendix 1 explains the 17 criteria that had been found from previous studies and literature surveys.
The treatment and the analysis of questionnaires occurred via the SPSS statistical package, edition 16. Specifically, horizontally on an SPSS page, the choice criteria of the suitable ERP system were registered, while in the corresponding vertical column was a questionnaire. The registration of data took place with coding 0 and 1. In other words, when an expert had selected a criterion, since he considered it important for the choice of ERP system, then this was recorded with the number 1 (very important), while the criterion not selected by the particular expert was recorded with a 0 (not significant). The next stage was the processing of questionnaires, aiming to ascertain the percentages relating to each criterion. The percentages corresponding to each criterion in the first round are presented in Table 2.

Table 2. Criteria proposed by the experts in round one

Criteria	Frequency of criterion by experts	Criteria	Frequency of criterion by experts
Cost	87%	Market position of the vendor	13%
Functionality	73%	Internationality of the vendor	13%
Service & support	67%	Cost of upgrade	13%
Ease of customization	67%	Obligation to the vendor	13%
Implementation time	40%	Platform	7%
Technical aspect	40%	Efficiency	7%
Cross module integration	40%	Security/privacy	7%
Compatibility with other systems	33%	Scaling	7%
Domain knowledge of software	33%	Viability vendor	7%
Vendor's vision	27%	Consulting Hellenic market	7%
Effective methodology of software	27%	Be Hellenist	7%
Consultancy	20%	Support from consultancy Hellenic market	7%
Parent/allied the default ERP System	20%	Number of consultancy Hellenic market	7%
Better fit with organization structure	13%	Scope for expansion	7%
Reliability	13%	Future industry production	7%
Friendliness	13%	Perfect system	7%
Fit with parent allied organization system	13%	Integrated system	7%
Usability	13%	Needs of company	7%
Vendors reliability in the core solution business	13%	Fit with parent allied vendors system	7%

For better processing, it was decided to regroup the results into categories in order to achieve better processing. Specifically, the groups that were created are the following: in the category consultancy are included the following criteria: consultancy, consultancy support in the Greek market, number of consultants in the Greek market and the experience of consultancy firms in the Greek market in terms of system installation. The percentage in this category is 41%. Moreover, in the category of vendor implementation time, apart from the time, reliability of vendor was also included. The percentage in this category is 26%. In the category vendor vision, apart from vendor vision is also included the robustness of the vendor company. The percentage in this category is 34%. Also, in the category better fit with organisation structure, apart from the former was also included the appropriateness of the system for the particular enterprise. The percentage in this category amounts to 47%. In the category of technical characteristics are included technical characteristics, platform, usefulness, safety, parameterisation, Hellinisation, the scope for expansion, efficiency, cost of upgrade, scaling. This category includes 100% of preferences. The category vendor's market position includes vendor viability. The percentage in this category is 20%. Finally, the methodology

of implementation includes also effectiveness, with a percentage of 34%. The results of this regrouping are presented in Table 3.

Table 3. Grouping of the criteria proposed by the experts in round one

Criteria	Frequency of criterion by experts	Criteria	Frequency of criterion by experts
Technical aspect	100%	Compatibility with other systems	33%
Cost	87%	Vendor's reliability in the core ERP solution business	26%
Functionality	73%	Market position of the vendor	20%
Ease of customization	67%	Fit with parent/allied organisation systems	13%
Service and support	67%	Internationality of the vendor	13%
Cross module integration	47%	Obligation to the vendor	13%
Consultancy	41%	Better fit with organisational structure	13%
Implementation time	40%	Fit with parent allied vendor system	7%
Effective methodology of the software	34%	Needs of company	7%
Vendor's vision	34%		

DELPHI ROUND TWO: IDENTIFICATION OF THE SELECTION CRITERIA

For the second round, the 19 most important criteria were selected, as presented in Table 3. In the questionnaire sent to experts are the criteria and percentages gathered for each criterion in the first round. In this round, the research participants were called upon to select on a scale of four points (very important, important, slightly important, not at all important), which criteria are considered important in the choice of an ERP system.

In this round the processing of questionnaires took place via SPSS, edition 16. Specifically, in this phase the rate of preference for each criterion in the second round was investigated. The analysis of data takes place using the same process as for the first round. The rate of preference of criteria in the second round according to the experts is presented in Table 4. The aim of the current research is to study the most important criteria in choosing an ERP system. Consequently, those criteria judged as important in the second round were those which achieved a percentage of above 60% in the categories important and very important, and are presented in Table 4.

Table 4. Criteria proposed by the experts in round two

Criteria	Frequency of criterion by experts	Criteria	Frequency of criterion by experts
Functionality	100%	Implementation time	57,1 %
Support from vendor	100%	Vendor's core reliability	57,1%
Technical aspect	85,7%	Compatibility with other systems	50%
Cost	71,5%	Market position of the vendor	50%
Cross module integration	71,5%	Internationality of the vendor	42,9%
Fit with parent/ allied organization systems	71,5%	Consultancy	35,7%
Ease of customization	71,4%	Effective methodology of the software	35,7%
Better fit with organisational structure	71,4%	Obligation to the vendor	14,3%
Needs of company	71,4%	Fit with parent allied vendors system	14,3%
Vendor's vision	64,3%		

CONCLUSIONS

The criteria of choice of an ERP system is a subject that has greatly occupied the experts (Baki and Cakar, 2005; Shehab et al, 2004) and so a variety of opinions have been expressed regarding which criteria are important in choosing an ERP system. It has therefore been difficult to achieve unanimity of opinion on the part of some of the experts regarding importance of criteria. In the present research, it was thought advisable to use the Delphi method in order to achieve this unanimity of opinion from the experts. However, despite the advantages of this system, there are also certain difficulties in its application. Specifically, the choice of suitable experts with knowledge on the subject is difficult. At the same time, the experts need to be convinced to allocate the required time and a high level of response on the part of experts during the rounds must be safeguarded. Also, the researcher should be in close contact with the experts for resolution of any problems which may arise during the research. Consequently, quite a lot of time is required for completion of research. In spite of all this, the method is judged particularly important, as noted below, in order that we see which criteria are now considered important in the choice of an ERP system in the Greek market.

The present research is made up of two rounds. In the first round, the criteria of choice of ERP system that resulted from bibliographic research are included. In the second round the criteria resulting from the first round are included. With the analysis of results in the second round, the outcome is criteria that are considered important and very important for choice of ERP system in the Greek market today.

A future stage of the present research will be to request the opinion of users at to which criteria they consider important. Following this, an analysis will take place as to what extent the opinions of experts and users coincide in judging the criteria important for choice of an ERP system.

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Appendix 1 A summary of the criteria found in literature

Criteria	Explanation
1. Functionality	The term functionalism has three sides: which functional regions the system covers so that enterprises' needs are satisfied, how much it is adapted to the data of the enterprise and also in the new technological data that comes up
2. Technical aspect	It uncovers the fit between IS and the needs of the end user
3. Cost	It includes the cost components of: software, hardware, consulting, training, implementation team, and other costs
4. Service and support	Support at the implementation phase and following the installation of the system
5. Vendor's vision	The modification that the vendor is planning to make to its products and services over the next years
6. Vendor's reliability in the core ERP solution business	The report becomes in the supplier and not in the ERP
7. Compatibility with other systems	The compatibility of ERP system with the remainder systems used by the enterprise
8. Ease of customisation	Aiming at its adaptation in the data of enterprise
9. Market position of the vendor	The supplier's market share
10. Better fit with organisational structure	The ERP system that will be selected should suit the organisational structure of the enterprise and be acceptable for its human recourse
11. Domain knowledge of suppliers	The particular characteristics and needs of enterprises that are included in the particular sector
12. Internationality of the vendor	Supplier which is active beyond the Greek market
13. Fit with parent/allied organisation systems	Compatibility with the system of enterprise
14. Cross module integration	A fully cross module integration is expected to be achieved; otherwise implementation time can be lengthen, implementation cost can be increased while the effectiveness of the system may be decrease
15. Implementation time	Case of overshooting of time involves further cost
16. Effective methodology of the software	How much the supplier of the ERP system follows a methodology of application, aiming at the rejection of useless and unnecessary activities
17. Consultancy	Use of advisors for the resolution of problems that will result at the implementation of ERP

Source: Percin (2008), Baki and Cakar (2005), Kumar et al (2003), Verville και Hallingten (2002), Bernroider and Koch (2001), Chen (2001), Somers and Nelson (2001), Themistocleous et al (2001), Avshalom (2000), Brewer (2000), Everdingen et al (2000), Illa et al (2000), Mabert et al (2000), Rao (2000), Siriginidi (2000), Sprott (2000), Bingi et al. (1999), Hecht (1997), , Shikarpur (1997).