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FEATURES OF ENTERPRISE RESOURCE PLANNING SYSTEMS THAT CAN HELP DECISION MAKING: THE USERS' PERSPECTIVE

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ABSTRACT

Information systems have a critical role in the several levels and areas of management of today's organizations including the management of organizational strategies. In this regard, Enterprise Resource Planning (ERP) systems are some of the most important information systems in organizations today. But benefits gained from the use of ERP systems in companies are mostly due to their transactional capabilities and their decision support features that can help the strategic management of the firm are less commonly used. In this study, perceptions of ERP users about the decision support characteristics of such software and what decision support features of these systems are important according to users are investigated. The analyses are based on a sample of data gathered from 50 firms using ERP software. Two brands of ERP software are compared based on the perceptions of their users in terms of their support of decision support characteristics. The results of the analyses can help potential users of ERP systems to decide in choosing these systems. Also for ERP vendors, the study indicates areas that may need improvement in their products regarding the decision support features.

INTRODUCTION

Information systems are an integral part of almost any company of any size in this information age. Almost every function of businesses is supported by some type of information technology / information systems including short term operational and long term strategic management of the firm. These systems are becoming more and more important each day and since they can help to improve the competitive position of companies they have a strategic value to the organizations (Zeng et al., 2003). Enterprise Resource Planning (ERP) systems are some of the most complicated information systems in use by the companies. They are supposed to integrate all functions of a business starting from suppliers and ending at customers (Chen, 2001).

Companies are spending millions of dollars for their ERP investments hoping to achieve the claimed benefits. Although these benefits are not so easy to achieve, firms continue to invest on these systems and it is a still a big market. Several researches done on ERP show that ERP systems are mostly known by their transactional capabilities. They are supposed to support daily operations of every department in a company. On the other hand, the collection and processing of huge amount of data by ERP systems creates opportunities for consolidation and the use of these data for decision making and therefore strategic use of it. In this study, replicating a previous research done by Holsapple and Sena (2003) with a data set of Turkish ERP users, these less used features of ERP systems are investigated. Based on the perceptions of ERP users what decision support characteristics exist in these systems and which of them are more important for the users are determined.

LITERATURE REVIEW

In order to compete and operate in a global economy, companies are making substantial investments in information systems and technology (IS/IT). There are several types of information system applications in organizations varying in size and purpose of use. Enterprise resource planning systems are among the most complicated and expensive information systems used in businesses. There are several reasons why companies invest in ERP systems; improving productivity, competitive advantage and customer demands being the most important of these reasons (Scott and Shepherd, 2002).

Maher (1999) defines ERP as "an integrated package

of software applications designed to automate and integrate a company's business processes throughout its entire supply chain and to provide immediate access to business information". Most distinguishing characteristic of ERP systems is that they integrate all business functions including manufacturing, finance, distributions, etc. thereby enabling a consistent flow of information between these functions (Bajwa et al., 2004). On the contrary, functional business information systems isolate one department from the other leading duplicate, inconsistent, erroneous and costly data entries.

ERP systems evolved as an extension of MRP and MRP II systems (Jacobs and Weston, 2006). These early systems were designed basically to handle materials and manufacturing management and some related processes. ERP, on the other hand, covers all the processes in an organization and provide a central repository for the whole data related to these processes. As an extension of these early systems, the main use of ERP is for daily transactional operations in the firm. But every day, data accumulates in the databases of ERP systems and this vast amount of data can be used to make sound and timely decisions as suggested by Davenport (1998). There is certainly a need for organizations to digest this huge amount of data and use it in decision making (Palaniswamy and Frank, 2000)

Decision making is anybody's function at the workplace but especially important for managers. Decision support systems are information systems that are designed to help the decision maker in several phases of decision making process. ERP systems, as information systems, can provide the necessary input; namely, information, in several usable forms, to aid decision making process. With the help of information systems, timely and consolidated data can be accessed and shared throughout the organization which can greatly help decision making (Legare, 2002). The user friendly presentation of such information makes it more useful.

In the literature, several features of decision support systems have been mentioned. Based on previous studies, Holsapple and Sena (2003) states that decision support characteristics of information systems should fall into one ore more of the following types; namely, knowledge repository, presentation, operation, request, and coordination characteristics. The inclusion of a knowledge base which can guide the decision maker in the decision making process and the ability of the system to acquire and keep several kinds of knowledge are referred to as knowledge repository. Presentation feature is the ability of the system to present knowledge in several customized and standard formats. Operation characteristics, on the other hand, is the feature of the system to select the required knowledge from the repository during the decision making process to derive and present new knowledge. The request feature of the decision support system is related to whether it can interact with the user in a flexible manner giving the user the ability to change the sequence of several knowledge management activities. Finally, coordination refers to the support of the system to facilitate the communication and interaction among multiple decision makers.

RESEARCH METHODOLOGY

In order to measure the decision support characteristics of ERP systems and the importance given to these characteristics by the users of these systems, the questionnaire developed by Holsapple and Sena (2003) is used. The questionnaire was first translated into Turkish by one of the authors and then revised taking into consideration the recommendations made by the other author for wording of some of the items. The items were converted to 5-point Likert scales. Also some demographic questions were added to the questionnaire. The 16 items used in the questionnaire are mentioned in Table 2 and Table 3. This questionnaire was then sent to several firms using ERP software and operating in different industries. At the end, 50 usable questionnaires were obtained from the firms contacted.

The demographic information related to the respondents and their companies and the ERP software they use are given in Table 1. Most of the firms are in textile industry (56%) and in several other industries including PVC, packaging, construction, logistics, automotive, petroleum distribution, machinery, and shipping. Firms were of varying sizes; some were large companies employing more than 1000 people (30%) and most of them SMEs employing between 50 and 250 employees (52%). Respondents were mainly middle level managers (52%) from finance department (84%) having a university degree (66%) and working for the company 1-5 years (62%). The ERP systems used by the companies are mainly two domestic ERP packages namely Netsis (38%) and Logo Unity (24%).

ANALYSIS AND RESULTS

Based on the data gathered from survey, first how the

TABLE 1. DEMOGRAPHICS INFORMATION

FIRM					
Industry		**Size (# of employees)**			
Textile	56%	10-50	4 %		
Packaging	8%	50-250	52%		
PVC	10%	250-500	6%		
Construction	8%	500-1000	8%		
Logistics	6%	>1000	30%		
Petroleum Distribution	4%				
Automotive	2%				
Marine Equip. Manufacturing	4%				
Machinery	2%				
RESPONDENT		**Position**		**Department**	
Gender		General Manager	4%	Finance	84%
Female	32%	Exec. Manager	16%	IT	2%
Male	68%	Manager	52%	Foreign Trade	4%
		Other	28%	Marketing	10%
Education		**Years of Employment**			
High School	10%	0-1	18%		
Community College	12%	1-3	36%		
University	66%	3-5	26%		
Masters / PhD	12%	5-8	6%		
		8-10	10%		
		>10	4%		
ERP SOFTWARE					
SAP	6%	Gold	6%	Logo Classic	2%
Oracle	2%	Logo Tiger	4%	Logo 2	2%
Logo Unity	24%	Micro Hally	2%	Turkuaz	2%
Canias	4%	AS 400	2%	Axapta	2%
Netsis	38%	SQL	4%		

users of ERP systems perceive the decision support characteristics are determined. The descriptive statistics of users' perceptions about the extent of the decision support characteristics in ERP systems they use are given in Table 2. The results show that users think such decision support characteristics are moderately supported in their systems. Almost all questions have a mean value of between 3,5 and 4 on a 5-point scale. According to the users, the characteristics that is supported most by their software is the provision of mechanisms to regulate the tasks performed by an individual decision maker (M=4,08). This is an indication of the fact that information systems can greatly help their users in structuring and regulating the tasks they perform. The second most supported feature is the provision of a knowledge repository by the ERP software to define, document and regulate the actions of decision participants (M=3,94). This is again a consistent finding with the fact that one of the most important features of ERP systems is their integrated data repository; namely, their centralized database. Provision of such a central database about almost all the data in the organization can be a great help in user's decision making processes. On the other hand, generation of new knowledge from existing data seems to be the least supported decision support characteristics of ERP systems. Users rated the automated calculation, analysis and reasoning features of their systems to derive new knowledge as the lowest (M=3,38) among all the investigated features. This shows a crucial decision support feature that is underrepresented by current ERP software. Other features that are not represented satisfactorily by ERP systems are related to delivery of knowledge about unanticipated needs and flexibility in the timing of various types of request from users (M=3,42 and M=3,52 respectively). This shows a need for more flexible reporting and querying tools and more complicated analysis features by ERP packages.

IIn order to compare the extent of support for decision support characteristics and how important these characteristics in users' view, the level of importance given to such characteristics is also provided in Table 2. This comparison can help in identifying the most important areas the ERP vendors should improve in their products because a feature that is considered important by users may not be existing at a satisfying level in their software. The table shows that users think that the support of decision support features by

ERP systems are important. Almost all items are given a value of 4 or above showing the importance given by the users. The most important of these features are the inclusion of a knowledge repository for solving problems in decision making (M=4,32) and the ability to derive new knowledge via automated calculation, analysis or reasoning (M=4,28). It is interesting to note that the latter feature is also the least supported feature by ERP systems according to the users as mentioned above. This points to an important area that ERP vendors should consider seriously for making improvements in their software. According to table, the ability of software to accept requests of users in different styles based on their tastes and needs is the least important decision support feature (M=3,70). But the high standard deviation (SD=1,09) of that item may indicate the conflicting viewpoints of users on that characteristic.

Finally, the level of support of decision support features in different ERP packages is analyzed. There are several ERP vendors in the Turkish market, some are domestic and some are international vendors. In the sample data of this study, two domestic ERP systems are used most by the responding companies: Netsis 38% and Logo Unity 24%. As shown in Table 3, both software systems have moderate levels of support for the specified decision support features. For some of these features, Netsis users rated their ERP software higher than Logo Unity users, but some others the reverse is true. For example, Netsis users think that their software provide mechanisms facilitating

TABLE 2. PERCEIVED DECISION SUPPORT CHARACTERISTICS OF ERP AND IMPORTANCE GIVEN TO THESE CHARACTERISTICS

	Extent of Support		Importance	
	Mean	D	Mean	SD
Includes a repository of knowledge used to identify and/or solve problems encountered in decision making	3,62	1,18	4,32	,68
Includes a repository of knowledge about decision participants used to facilitate interactions among decision participants	3,58	1,28	4,22	,62
Includes a repository of knowledge used to define, document, or regulate the actions of decision participants	3,94	,93	4,16	,58
Allows private knowledge repositories under the access control of individuals	3,80	,93	3,92	1,05
Allows public repositories of organizational knowledge with shared access	3,80	,93	4,06	,93
Accepts requests in styles that suit the tastes or needs of decision participants	3,54	1,07	3,70	1,09
Gives users flexibility in determining the timing of requests—from spur-of-the-moment to scheduled requests	3,52	1,18	4,06	,77
Selects and delivers knowledge to meet unanticipated needs	3,42	,97	4,10	,65
Derives new knowledge via automated calculation, analysis, or reasoning	3,38	1,28	4,28	,70
Presents results in formats customized to suit the tastes or needs of decision participants	3,54	1,25	3,76	1,19
Provides mechanisms to facilitate communication among decision participants within the organization	3,80	1,14	4,06	,89
Provides mechanisms to facilitate communication among decision participants across the organization's boundaries	3,88	1,02	3,94	1,13
Provides mechanisms to structure and regulate tasks performed by an individual decision maker	4,08	,94	4,08	,83
Provides mechanisms to structure and regulate tasks performed by multiple participants jointly making a decision	3,76	1,08	4,12	,63
Provides mechanisms to structure and regulate the making of interrelated decisions	3,76	1,12	3,96	,73
Provides mechanisms to structure and regulate tasks performed in decision making that crosses organizational boundaries	3,56	1,16	4,04	,73

TABLE 3. PERCEIVED DECISION SUPPORT CHARACTERISTICS OF ERP BY VENDOR

	Logo Unity		Netsis	
	Mean	SD	Mean	SD
Includes a repository of knowledge used to identify and/or solve problems encountered in decision making	4,17	1,19	3,74	,99
Includes a repository of knowledge about decision participants used to facilitate interactions among decision participants	4,00	1,28	3,84	1,07
Includes a repository of knowledge used to define, document, or regulate the actions of decision participants	4,33	,89	4,05	,91
Allows private knowledge repositories under the access control of individuals	3,75	1,06	4,16	,60
Allows public repositories of organizational knowledge with shared access	4,00	,95	4,00	,47
Accepts requests in styles that suit the tastes or needs of decision participants	3,50	1,09	4,05	,78
Gives users flexibility in determining the timing of requests—from spur-of-the-moment to scheduled requests	3,58	1,08	3,89	,99
Selects and delivers knowledge to meet unanticipated needs	3,92	,67	3,42	,90
Derives new knowledge via automated calculation, analysis, or reasoning	3,42	1,31	3,89	,81
Presents results in formats customized to suit the tastes or needs of decision participants	3,58	1,16	3,89	1,10
Provides mechanisms to facilitate communication among decision participants within the organization	3,75	,97	4,21	1,08
Provides mechanisms to facilitate communication among decision participants across the organization's boundaries	3,83	,72	4,37	,96
Provides mechanisms to structure and regulate tasks performed by an individual decision maker	4,17	,58	4,32	1,06
Provides mechanisms to structure and regulate tasks performed by multiple participants jointly making a decision	3,83	,94	4,26	,87
Provides mechanisms to structure and regulate the making of interrelated decisions	3,75	1,06	4,16	,96
Provides mechanisms to structure and regulate tasks performed in decision making that crosses organizational boundaries	3,75	1,14	4,05	,97

communication among decision making users across the boundaries of their organizations at a high level (M=4,37) while Logo Unity users don't think that their software support these features at such a high level (M=3,83). On the other hand, according to Logo Unity users' view, this software includes a repository of knowledge used to define, document or regulate the actions of decision support participants at a high level (M=4,33), but Netsis users don't think that their software's support is that high for this feature (M=4,05). Similar differences exist among other dimensions of the decision support characteristics that are measured between these two ERP packages. For example, Netsis users rated the inclusion of a repository of knowledge used to identify and/or solve problems encountered in decision making as the lowest supported decision support feature in that software (M=3,74) whereas Logo Unity users think that their software is not very powerful in deriving new knowledge via automated calculation, analysis, or reasoning (M=3,42). Since the sample data is not so big, these differences don't lead to conclusions about which software packages support more decision support features compared to others. More detailed studies should be conducted

using different data samples to help guide ERP users when choosing such software. Also ERP vendors may benefit from the results of these studies both in the future development efforts of their software and in their marketing activities.

DISCUSSION AND CONCLUSIONS

This study explores the decision support features that are supported to some extent by ERP systems based on a sample data of Turkish ERP users. Given the fact that information systems play an ever increasing crucial role in our organizations, the study is important for both users and providers of such software systems. Most of the studies about ERP deal with the benefits of ERP systems that are due to record keeping or transaction handling features of these systems. But ERP systems collects, organizes and consolidates huge amount of data which can be used to help in decision making in the organizations they are used. The results of this study show that the ERP packages provide such decision support features but only at a moderate level. The users think that the features that are investigated in this study are important but are not present at a satisfactory level in their ERP systems. Several such features examined in the study, for example, ERP users think that the ERP systems derives new knowledge via automated calculation, analysis, or reasoning is very important (M=4,28) but their perception is that these features don't exist at a high level (M=3,38) in their ERP software.

The study has several limitations. First of all, it is based on a small convenience sample. Analysis based on such samples cannot be generalized but they provide valuable insights into the subject. Also the market shares of the ERP software included in the study may not be similar to their level of representation in this study. For example, SAP, a market leader in the world and an important player in Turkish market, can be said to be underrepresented in the study (6% only). Similar comments can be made about other software packages, too. Another caution about the sample is that most of the respondents are in textile industry (56%) which means that there is a bias towards the users of this industry and care should be taken in generalizing the result to other industries.

This study contributes to both academic ERP literature and professional community by examining the less investigated decision support features of ERP systems. Users of ERP systems may utilize the findings of the study in selection and evaluation of different ERP vendors and take these features into consideration later during the implementation of ERP projects. Also, ERP vendors may benefit from the results of the study such that they may include new offerings related to decision support in future releases of their software and they can use these features in their marketing activities. Future studies about the subject may investigate the effects of several factors like user type, the length of ERP use, industry type, etc. on the perception of ERP users about the decision support characteristics of these systems.

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