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System Characteristics, Perceived Benefits, Individual Differences and Use Intentions:
a Survey of Decision Support Tools of ERP Systems

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ABSTRACT

Limited research has considered the value derived from using enterprise resource panning (ERP) systems for decision making support. This paper aims to evaluate the impact of a set of individual differences, system characteristics, and perceived benefits of the system, on the intentions to use ERP systems for decision support. A field study was used to collect data from managers working in Bahraini enterprises that use ERP systems. The results indicate that individual differences concerning age, gender, level of education, and even computer self efficacy did not influence intentions of using the decision tools of ERP systems. The only individual difference that showed significant influence is the degree of knowledge of the system. In addition, both perceived shared benefits and system characteristics had significant influence on the intention to use the system for decision support tasks, through perceived ease of use and perceived usefulness. The paper discusses the implications of these findings and ends with possible extensions of the study.

Keywords: *decision support tools; ERP implementation; IS use in Bahrain; technology acceptance*

INTRODUCTION

Over the past decade, organizations around the world have spent billions of dollars implementing ERP systems. Motives of adopters of ERP systems have focused primarily on revolutionizing transaction handling by improving business processes and integrating operations and data. The current generation of ERP packages holds the promise of improving online analytical capabilities to enhance the organization's business intelligence as well.

ERP systems could be defined as comprehensive software packages that seek to integrate the complete range of business processes and functions in order to present a holistic view of the business from a single information and information technology architecture (Gable,

1998). Implementing an ERP system is a costly and risky project. The cost of a full implementation in a large international organization can easily exceed $100 million. A recent survey of 63 companies—with annual revenues ranging from $12 million to $63 billion—indicated that ERP projects cost $10.6 million and take 23 months on average to complete (Umble & Umble, 2002). Moreover, their implementation environments are often very complicated. They usually require large-scale business process reengineering (BPR) undertakings, complex technical arrangements for integrating the core ERP technology with any existing or future software, as well as careful management of the contributions of several participants in the projects such as: functional departments, consultants, business partners, and vendors. All these requirements and more, magnify project management challenges for such projects, making them prone to implementation failure.

Despite these challenges, investments in these systems are increasing, making the ERP software one of the fastest growing markets in the software business. In the 1990s some statistics projected its eventual market size to be around $1 trillion by the year 2010 (Bingi, Sharma, & Golda, 1999). Moreover, expectations for keeping these interests in ERP investments are even bigger in the 2000s. This is because, though they were originally developed and implemented for transactional aspects, a growing need to use these systems for decision support has recently become clear. Lately, these software packages are incorporating decision support tools in order to take advantage of data storage, access, scrubbing, and integration capabilities facilitated by ERP systems (Turban, Aronson, & Liang, 2005). On the other hand, the confluence of ERP and decision support technology has begun to draw the attention of academia as well (Shafiei & Sundaram, 2004). Obviously ERP vendors, implementers, and researchers need to understand the factors that affect their usability. Based on this need, this article's main objective is to identify the main contextual variables that influence the acceptance of decision support tools of ERP systems. Three groups of variables were introduced in our theoretical model: (1) individual differences, (2) perceived shared beliefs of the decision support benefits of these systems, and (3) system characteristics.

The second section of this article reviews prior literature on ERP and decision support. In addition, it provides a brief explanation of TAM as the guiding basis for the theoretical framework of this research. The third section introduces the research model along with a discussion of the model variables. The fourth section describes the study's methodology. The fifth section reports findings on the factors that are found to be influencing the use of these systems. The last section concludes the study with a discussion of the main findings and suggestions for future investigations.

LITERATURE REVIEW

ERP and Decision Support

Very few studies have addressed issues related to incorporating ERP systems and decision support tools. This is mainly because ERP and decision support systems (DSSs) have independently evolved and adopted in the marketplace as well as in academia. Consequently, each subject has its own separate studies. On the other side, plenty of research efforts have been introduced for technology/information systems acceptance or usability. In the following paragraphs, we tried to briefly present the research most related to our study's main objective.

Starting with the ERP aspect, many researchers have provided frameworks and insights that tried to explain success of ERP systems implementation. We thought that these success factors' frameworks could be helpful in providing a basis for synthesizing an initial acceptance theory for incorporating ERP and DSS tools for our research. Akkermans and Van Helden (2002) and Al-Mashari, Al-Mudimigh, and Zairi (2003) for example, used a case study approach to provide rich accounts of the implementation processes for some selected individual companies. Other studies used a statistical approach to develop and test different

theoretical models that identify several critical success factors, using samples of firms that have recently implemented ERP systems (Bradford & Florin, 2003; Hong & Kim, 2002). Examples of factors tested in such studies are: top management support; effective communication; project management; business plan and vision; software testing and trouble shooting; and monitoring and evaluation of performance. Another important direction this literature has tried to examine is how such critical factors differ in their impact or contribution to success, according to the different stages in the life cycle of the ERP implementation project (Markus, Tanis, & Van Fenema, 2000; Rajagopal, 2002).

Previous studies concerning DSSs use or adoption had other streams that could be used as well for building a relevant background for this study. For example, some researchers paid great attention to issues such as patterns of use or areas where such DSS tools are used and how these patterns affect perceived value and satisfaction (Vlahos, Ferratt, & Knoepfle, 2004). Others concentrated on how acceptance levels of these systems differ according to managers' individual differences, such as gender and cognitive and decision style (Bruggen & Wierenga, 2001; Lu, Yu, & Lu, 2001). One important development in this area is the steady growth of business intelligence and business analytics technologies' industry, with revenues reaching into low billions, according to some statistics (Turban et al., 2005). Moreover, tools concerning data mining, data warehousing, and knowledge management systems are becoming easier to use and consequently more promising for higher levels of usability. One of the surveys concerning these developments showed that approximately 35% of corporate management and staff directly used data mining tools (Nemati & Barko, 2001).

The confluence of ERP and DSSs is still in its initial stage, though clear interests could be cited. For example in a field study of six ERP implementations, Palaniswamy and Frank (2000) described organizations' need to digest the vast amount of information from the environment and make fast decisions. Shafiei and Sundaram (2004) explained that DSS tools take advantage of the data resident in ERP systems. Holsapple and Sena (2005), in their survey that examined the connections between ERP systems' objectives and decision support benefits, found that organizations did consider four objectives for decision support to be fairly important while planning their ERP projects. These objectives are: (1) shifting responsibility of decision making, (2) supporting interrelated decision making, (3) supporting multiple persons working jointly on a decision, and (4) supporting individual decision makers. On the other side, the survey showed that ERP systems do indeed provide substantial decision support benefits concerning the following: enhancing knowledge processing, improving competitiveness, reducing decision costs, and supporting multi-participants' decision making.

Technology Acceptance Model

Identifying factors that determine user's adoption of IS has drawn much attention in the last two decades. This is due to the realization that millions of dollars could be spent on these systems, while potential users may not even use them. TAM is an established model in explaining IS adoption behavior. It is based on theories in social psychology such as theory of reasoned action (TRA), and the theory of planned behavior (TPB). TAM has been frequently found to have better explanatory power than other models or theories used in the IS adoption subject (Davis, Bagozzi, & Warshaw, 1989; Taylor & Todd, 1995).

According to TAM, usage of an IS is determined by users' intention to use the system, which in turn is determined by users' beliefs about the system. There are two kinds of salient beliefs involved: perceived usefulness and perceived ease of use of the system. Perceived usefulness (PU) is defined as the extent to which a person believes that using the system will enhance his job performance. Perceived ease of use (PEOU) is defined as the extent to which a person believes that using the system will be free of effort. Furthermore, both

types of beliefs are subjected to the influence of external variables. By manipulating these external variables, system developers can have better control over users' beliefs of the system, and subsequently, their behavioral intentions and usage of the system. A good review of this stream of research is provided by Lucus and Spitler (1999), and Legris, Ingham, and Collerette (2003).

TAM has been applied to a wide range of IS applications. However, very few have used it for complicated systems such as ERP. Amoako-Gympah and Salam (2003)—probably the first to extend using TAM in an ERP implementation environment—have examined the impact of training and project communications on shared beliefs about the benefits of the ERP technology and how these shared beliefs influence the TAM core framework. Amoako-Gympah (2005), in another study, looked at the influence of prior usage, argument for change, intrinsic involvement, and situational involvement on PU and PEOU of TAM. Also Calisir and Calisir (2004), based on data obtained from 35 end users in 24 companies, found that PU and learnability could be significant determinants of end-user satisfaction with ERP systems. In addition, PEOU and system capability seemed to affect PU, while user guidance seemed to influence both PU and learnability.

This article represents an extension to this line of studies. From one side, it tries to contribute to the current interests in integrating ERP and the decision support tools body of research. From the other side, it tries to meet the need to understand the main factors that affect the use of this side of the system. The few current studies, which investigated the acceptance of ERP systems, concentrated on the general use of ERP systems, which is more oriented towards the classical transactional part of these systems. We believe that the decision support part of ERP systems requires separate investigation concerning its usability.

It is important to note here that using TAM for this research was not for the sake of introducing another TAM example. We came to a belief in the beginning of this study that measuring the intentions to use the system is more appropriate than measuring its real use. We expect that the use of the decision support tools accompanying ERP systems is still relatively limited, as these systems are traditionally considered as transactional systems. Moreover, using TAM had many advantages for such research studies. Firstly, it informs researchers of what types of contextual factors could be included and how their relationships might be. Secondly, it provides an important basis for comparisons and extensions with previous research in IS. Thirdly, many of the academics feel comfortable with TAM, though some still do not feel relaxed with the link between intentions to use the system and its real use. However the big previous bulk of research concerning TAM, indicates a high level of acceptance of the model, which eases understanding of any future extensions.

RESEARCH MODEL AND HYPOTHESES

Many factors have been selected by prior studies as potential predicators for IS use intentions. Examples are: top management support, project management capabilities, and BPR competencies. However, our main concern was to include only those that are specifically related to the decision support part of the system. This criterion made us eliminate many factors that seemed more appropriate to the traditional transactional aspect of the system. In the end, three main categories of external variables have been selected, namely: (1) individual differences, (2) system characteristics, and (3) shared beliefs about the benefits of the system. We thought that it is fairly logical to

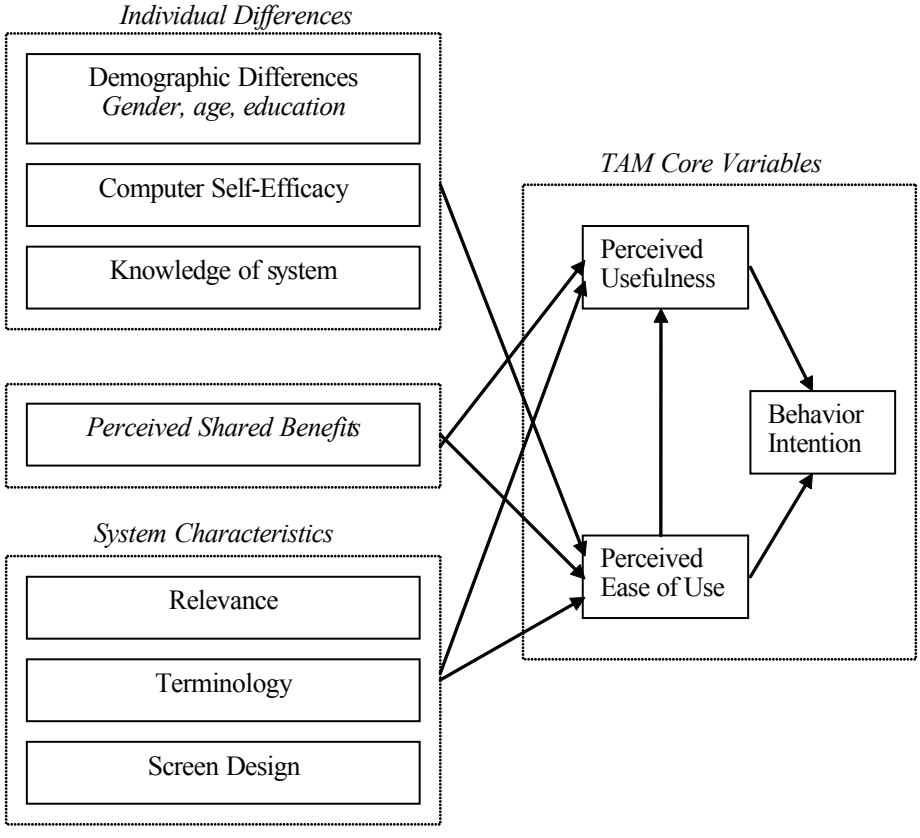
expect that managers' intentions to use such a system rely more on how they perceive its specific benefits to their work, how friendly and relevant this system is to use, and other items related to their individual characteristics. These three groups of variables have been emphasized in most of the classical TAM research studies (Agarwal & Prasad, 1999; Davis, 1989; Igbaria & Iivari, 1995; Venkatesh, 1999). The proposed research model includes three individual difference variables and three system characteristics, besides shared beliefs items about the benefits of ERP for decision support (see Figure 1) and the selection of which are supported by prior studies in the IS literature. The following is a discussion for these variables.

Individual Differences

Individual differences are believed to be most relevant to both the decision-making process (Klenke, 2003; Lu et al., 2001; Smith, 1999) and ISs' use intentions (D'Ambra & Wilson, 2004; Kotey & Anderson, 2006; Lai & Li, 2005; Mafe & Blas, 2006; Olson & Boyer, 2003). In this study, we examined three variables concerning individual differences: demographics, computer self-efficacy (CSE), and knowledge of system.

The demographic variables or the personal characteristics selected for this research are: gender, age, and education. Previous research

Figure 1. Research model



efforts showed how information systems' use intentions differ between men and women (Lai & Li, 2005; Mafe & Blas 2006); how differences in age influence users' levels of computer anxiety and consequently use intentions (Kotey & Anderson, 2006; Lu, Yu, Liu, & Yao, 2003); and how computerized ISs' use is related to the users' level of education (Mafe & Blas, 2006; Olson & Boyer, 2003).

Besides demographics, CSE is one of the classical individual differences, usually found as an important predicator for IT usage (Compeau & Higgins, 1995) and PEOU of information systems (Agarwal, Sambamurthy, & Stair, 2000; Igbaria & Iivari, 1995). Knowledge of the system is another important individual difference that has been found as a significant contextual variable for IT/IS use intentions (Benbasat, Dexter, & Todd, 1986; Hong, Thong, Wong, & Tam, 2002). Apart from TAM suggestions of what variables to include in the research model, considering individual differences is especially important for DSSs, where higher levels of interactivity and mutual learning are expected to exist between the system and the user (Turban et al., 2005). Differences in individual characteristics will then influence how users interact with the system and consequently their use intentions.

According to TAM, individual differences usually influence PEOU, but not PU (Hong et al., 2002; Igbaria & Iivari, 1995), as shown in Figure 1. Based on the previous discussion, our related hypotheses are:

H1a: *Using ERP systems for decision making will be perceived easier for male than for female managers.*

H1b: *Using ERP systems for decision making will be perceived easier for younger managers.*

H1c: *Using ERP systems for decision making will be perceived easier for managers with more education.*

H2: *Using ERP systems for decision making will be perceived easier for managers with higher levels of computer self-efficacy.*

H3: *Using ERP systems for decision making will be perceived easier for managers with higher levels of knowledge of the system.*

System Characteristics

The main logic behind including system characteristics in this framework is that the study deals with a relatively complex system. Consequently, we expected higher influences on factors related to how friendly their interfaces are and how relevant their functions are to the users' main tasks. The relationships between system characteristics and TAM beliefs' constructs have been investigated in many studies (Hong et al., 2002; Venkatesh & Davis, 2000). Researchers usually use a general construct that represents this variable, such as "perceived system quality" (Igbaria, Gumaraes, & Davis, 1995) or "output quality" (Venkatesh & Davis, 2000). This study relied on Hong et al.'s (2002) three system characteristics to be investigated in this research, namely: relevance, terminology, and screen design.

Relevance can be interpreted as the degree to which the system matches users' information needs. Terminology refers to the words, sentences, and abbreviations used by a system. Screen design is the way information is presented on the screen. Similar to individual differences, system characteristics are especially important for DSSs, to facilitate higher levels of interactivity between the system and the user.

However, the difference between system characteristics and the individual differences variable, according to TAM previous studies, is that it is expected to influence both PEOU and PU of TAM core constructs and not only PEOU as depicted in Figure 1 (Davis, 1989). According to the previous arguments, we expect that:

H4a: *Relevance of the ERP system will have a positive effect on perceived ease of use of the decision support tools of the system.*

H4b: *Relevance of the ERP system will have a positive effect on perceived usefulness of the decision support tools of the system.*

H5a: *Terminology clarity of the ERP system will have a positive effect on perceived ease of use of the decision support tools of the system.*

H5b: *Terminology clarity of the ERP system will have a positive effect on perceived usefulness of the decision support tools of the system.*

H6a: *Screen design of the ERP system will have a positive effect on perceived ease of use of the decision support tools of the system.*

H6b: *Screen design of the ERP system will have a positive effect on perceived usefulness of the decision support tools of the system.*

Perceived shared beliefs of benefits

A shared belief about the specific benefits of the system in the organization may play a significant role in shaping the usage intentions of that system. Obviously, this factor is important because the main benefits of ERP are traditionally referred to their transactional aspects. Therefore, it was included to investigate the items specifically related to the decision-making benefits that the system may bring. It is different than the PU variable in the TAM construct, which is usually used to measure the general usefulness of the system in question. Thus:

H7a: *Perceived shared beliefs of the decision-making benefits of ERP systems will have a positive effect on perceived ease of use of the decision support tools of the system.*

H7b: *Perceived shared beliefs of the decision-making benefits of ERP systems will have a positive effect on perceived usefulness of the decision support tools of the system.*

TAM Variables

Extensive research over the past two decades provided evidence of the significant effect of PEOU and PU on users' intentions to use an information system (Agarwal & Prasad, 1999; Davis et al., 1999; Hu, Chau, Sheng, & Tam, 1999; Venkatesh, 1999). These studies also showed that while PU has direct impact on use intentions, PEOU has direct and indirect impacts. Hence, we hypothesize that:

H8: *Perceived usefulness will have a positive effect on behavior intention to use the decision support part of the ERP system.*

H9a: *Perceived ease of use will have a positive direct effect on behavior intention to use the decision support part of the ERP system.*

H9b: *Perceived ease of use will have a positive indirect effect on behavior intention to use the decision support part of the ERP system through its effect on perceived usefulness of the system.*

METHODOLOGY

Study Context: The Kingdom of Bahrain

The Kingdom of Bahrain is a small Arabian island centrally located in the Arabian Gulf, with a monarchy rule form. Its economy depends on oil revenues. Facing declining oil reserves, Bahrain has turned to petroleum processing and refining imported crude. Also, it has transformed itself into an international banking center. Other important industries are aluminum smelting and tourism. Current population is approximately 688,000 residents of whom approximately 235,000 are not nationals. (For more details about the Kingdom of Bahrain, see http://www.odci.gov/cia/publications/factbook/geos/ba.html)

Measures

A survey methodology was used to gather data for this study. Straub's (1989) guidelines to validate the instrument of this research were followed. Items used in the operationalization

of the constructs were drawn from relevant prior research and provided in Appendix A. One advantage of using TAM to examine the adoption of a specific IS is that it has well-validated measures. PEOU, PU, and behavior intentions constructs were measured by items taken from the previously validated inventory of measures and modified to suit the current context (Agarwal & Prasad, 1999; Hong et al., 2002).

The CSE instrument developed by Compeau and Higgins (1995) was used in this research. Knowledge of the system was assessed by two items suggested by Davies (1997): familiarity with using the system and knowledge about using the system for the users' specific decisions problems. Items for measuring the three system characteristics were taken from Hong et al.'s (2002) user survey and were rephrased for the context of the study's specific ISs. Perceived shared benefits were self-developed based on related previous studies such as Holsapple and Sena (2005) and Amoako-Gympah, (2005). Likert scales (1~7), with anchors ranging from *strongly disagree* to *strongly agree*, were used for all questions except for the items measuring CSE. The anchors of the items measuring CSE ranged from *not at all confident* to *totally confident*. The mean of the scores over all questions provided the composite score for each variable. The adopted instrument, along with all its items, was discussed with three industry executives from three different organizations experienced with using ERP for decision making and with two faculties. Based on their feedback, minor changes to reflect the research settings were made in the instructions and wording of some of the items. The subjects who had participated in this convenience pretest were excluded from the final data collection and subsequent study.

Sample and Procedure

Only 10 companies were found to have prior experience in ERP systems in Bahrain. To come up with this list of companies, Vendors' Web sites (Arabian branches) were reviewed and brief telephone interviews were made with their representatives in Bahrain. The IT manager of each company was contacted to help us come up with a list of potential interviewees for the study.

The targeted informants are all the managers who use ERP systems to assist him/her in decision making. There were no restrictions on the organizational level of the manager, whether in top, mid-management, or operational level in the organization. Also, no restrictions were imposed on the functional activity where the decision makers work. The list of the potential informants had approximately 20 informants for each company. Consequently about 200 copies of the questionnaire were sent to the IT managers of these companies, who forwarded them to the targeted informants in their companies.

Table 1. Sample description: companies profile

Company	***ERP Vendor***	***Use period***	***No. of employees***
Batelco (Bahrain Telecom co)	SAP	3	1600
Asary (Arab Ship-building & Repair Yard)	Oracle	5	1200
Bahrain flour mills	Orion	1	100
Bapco (Bahrain Petroleum)	Oracle	3.5	3000
Aldhaen Craft	Oracle	3	200
GFH (Gulf Financial House)	Oracle	2	100
Alba (Aluminum Bahrain)	SAP	5	3000
Midal Cables	Oracle	4	310

Before answering the questionnaire, respondents were asked whether they have enough experience in using the system for some decision-making activity or not. Only 84 interviewees returned the questionnaire (a response rate of 42%) from 8 companies. Nine of the questionnaires were dropped because seven of them had incomplete answers. The other two came from two managers who have not used the system yet, as was indicated by one of the questions in the questionnaire. Table 1 shows the companies participating in the study, while table two provides a profile of the respondents.

Validity and Reliability

Reliability

Reliability is the consistency or precision of a measuring instrument that is the extent to which the respondent can answer the same or approximately the same questions the same way each time (Straub, 1989). The internal consistency reliability was assessed by calculating Cronbach alpha values. The results of the reliability test conducted for the study's constructs are summarized in the fifth column of Table 3. All alpha scores were above 0.70, which suggest an acceptable level of reliability for the study's constructs (Field, 2000).

Table 2. Sample description: Respondents profile

	Frequency	*Percentage*[a]
Gender		
Male	61	81
Female	14	19
Age		
Mean = 37. 7		
SD = 9.2		
Department		
Accounting & finance	25	33
Information technology	11	15
Product managers	7	9
Product marketing	7	9
Planning and project management	6	8
Other departments (engineering, logistics and procurement, production and maintenance, human resources)	19	25
Experience in management positions		
Mean = 9.3 years		
SD = 6.8		
Experience in using ERP in Decision making		
Mean = 4 years		
SD = 2.9		
Educational level		
Master's degree	22	29
Post graduate diploma	7	9
Bachelor degree	38	50
Diploma (associate degree)	9	12
Respondents from each type of business		
Manufacturing (5 companies)	33	44
Oil (1 company)	19	25.3
Telecommunication (1 company)	16	21.3
Banking and finance (1 company)	7	9.3

[a] *Due to rounding the percentage may not add up to 100*

Table 3. Summary statistics, and reliability and validity analysis

Measures	*Items*	*Mean*	*SD*	*Reliability (Cronbach's Alpha)*	*Validity:(Items loadings on single factors*[a]
Behavior intention	2	5.7	0.9	0.82	0.57; 0.70
PU	3	5.6	0.9	0.91	0.79; 0.84; 0.83
PEOU	3	5.2	1.1	0.79	0.64; 0.60; 0.81
Relevance	2	5.0	1.3	0.86	0.74; 0.79
Terminology	2	4.9	1.1	0.73	0.82; 0.61
Screen design	2	4.7	1.5	0.89	0.54; 0.72
Perceived shared benefits	8	5.4	0.8	0.88	0.77; 0.78; 0.59; 0.65; 0.59; 0.60; 0.82; 0.76
Knowledge of system	2	5.4	1.0	0.85	0.74; 0.75
Computer self-efficacy	8	4.9	0.9	0.78	0.71; 0.56; 0.90; 0.57; 0.76; 0.79; 0.87; 0.81

[a] *Extraction method: Principal component analysis; rotation method varimax with Kaiser normalization; egienvalue = 1*

Discriminant Validity

Since each variable was measured by multi-item constructs, a discriminant analysis should be employed to check the unidimensionality of the items. Discriminant validity was checked by conducting a factor analysis. In Table 3, discriminant validity was confirmed when items for each variable loaded onto single factors with loadings of greater than 0.5 (Nunnally, 1978). Table 3 provides the loadings of each item of the independent and the dependent variables. Nine factors emerged with no-cross construct loadings above 0.5, indicating good discriminant validity.

Based on these examinations of the psychometric properties of the scales, we conclude that each variable represents a reliable and valid construct (Field, 2000).

RESULTS AND ANALYSIS

The means and standard deviations of all the variables of the study are summarized in Table 3. A multiple regression analysis was employed to identify which variables made significant contributions to predicting the dependent variables: use intentions, PU, and PEOU, to test hypotheses H1-H9a. Also, a path analysis was used for hypothesis H9b. Path analysis is a regression-based technique widely used for studying the direct and indirect effects in models encompassing mediating variables, similar to the research model proposed in this study. The intercorrelation matrix (Table 4) was first examined to assure the validity of the regression analysis, looking for possible multicollinearity problems. All intercorrelations among exogenous variables were reasonably low. Hair, Anderson, Tatham, and Balck (1995) suggest that values of $r > 0.80$ indicate a multicollinearity problem.

The results of the regression analysis, including *B* coefficient, *t*-statistic, and significance level for each independent variable, are reported in Table 5. The first regression model showed that both PU and PEOU were found to be significant determinants of the dependent variable namely, the intentions to use the decision tools of ERP systems. Also R^2 value of the model indicated that it explains 39% of the dependent variable total variance. However, the relative strength of their explanatory power was different. PEOU ($B = 0.46$, $p < 0.001$) was a much stronger predictor of managers use intentions as compared to PU ($B = 0.25$, $p < 0.05$).

The results provided support for H8 (PU—use intention relationship); and H9a (PEOU—use intention relationship).

In the second regression model, PU was regressed on perceived shared benefits, system relevance, system terminology, and system screen design. This analysis yielded a regression function ($R^2 = 0.32, p < 0.001$) with three significant predicators: (1) perceived shared benefits ($B = 0.23$, $p < 0.01$), (2) system relevance ($B = 0.34$, $p < 0.05$), and (3) system terminology ($B = 0.33$, $p < 0.05$). The results provided support for H4b (systems relevance—PU) H5b (system's terminology—PU); and H7b (shared benefits—PU). The findings however, failed to support H6b concerning the relationship between system screen design and PU.

Also a multiple regression method was applied to determine variables influencing PEOU. The results reported in Table 5 showed that only system terminology ($B = 0.33$, $p < 0.05$), and perceived benefits ($B = 0.36$, $p < 0.01$) have significant effects on PEOU. These variables explained approximately 40% of the variance in PEOU. Based on these results, H5a (system terminology—PEOU), and H7a (perceived shared benefits—PEOU) were also supported. The analysis failed to support H1a, H1b, H1c, H2, H3, H4a, and H6a. These concern the relationships between gender; age; education; CSE; knowledge of the system; system relevance; and system screen design, and PEOU.

Following the suggestions of Cohen and Cohen (1983), a hierarchical multiple regression was used to test the mediation hypothesis (H9b). I regressed behavior intention on PU in the first step, with PEOU in step two. The unique contribution of PEOU (in explaining behavior intention) was examined over and above the PU variable. Table 6 showed that the change in R^2 after introducing project success into the equation is significant (R^2 change = 0.043, $p = 0.01$), giving support to the proposed mediation hypothesis (H9b). Table 7 summarizes hypotheses testing results.

DISCUSSIONS, CONCLUSIONS, AND LIMITATIONS

This study tried to contribute to the emerging research efforts concerning the convergence of ERP systems and decision support tools. We tried to provide an understanding of the

Table 4. Correlation matrix between variables

Measures	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	*(10)*	*(11)*	*(12)*
Behavior intention (1)	1											
PU (2)	.59**	1										
PEOU(3)	.49**	.53**	1									
Relevance (4)	.33**	.46**	.35**	1								
Terminolog7 (5)	.40**	.44**	.50**	.49**	1							
Screen design (6)	.38**	.35**	.48**	.68**	.69**	1						
Perceived shared benefits (7)	.39**	.39**	.50**	.38**	.33**	.40**	1					
Knowledge of system (8)	.25*	.40**	.35**	.49**	.68**	.59**	.25*	1				
Computer self-efficacy (9)	.11	.21	.14	.16	.06	.03	.22	.24*	1			
Gender (10)	-.02	.01	-.02	-.16	.00	-.10	.01	-.05	.04	1		
Age (11)	-.03	.04	.03	.04	.06	-.03	.04	.01	-.17	-.31**	1	
Education (12)	.04	-.12	-.16	-.05	-.03	-.12	-.09	-.04	.14	-.02	-.15	1

** $p < 0.05$; ** $p < 0.01$*

Table 5. Multiple regression results

Dependent variables	R^2	*Independent variables*	*B*	*t*	*Sig.*
Behavior intention	0.39***	PU	0.25	2.26	0.027*
		PEOU	0.46	4.25	0.000***
PU	0.32***	Perceived shared benefits	0.23	2.07	0.002**
		Relevance	0.34	2.51	0.014*
		Terminology	0.33	2.43	0.018*
		Screen design	-0.27	-1.27	0.210
PEOU	0.40***	Perceived shared benefits	0.326	2.95	0.004**
		Relevance	-0.054	-0.395	0.694
		Terminology	0.33	2.155	0.035*
		Screen design	0.175	1.04	0.302
		Knowledge of system	-0.066	-0.466	0.643
		Computer self-efficacy	0.082	0.756	0.452
		Gender	-0.028	-0.267	0.791
		Age	-0.004	-0.33	0.974
		Education	-0.116	-1.154	0.253

** $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$*

Table 6. Hierarchical regression results

Regression step 1		***Regression step 2***		***Change in R^2***
R^2	*p*	R^2	*p*	
0.349	0.000	0.392	0.027	0.043

Table 7. Hypotheses testing results

	PEOU		***PU***		***Behavior intention***	
	No.	Support	No.	Support	No.	Support
Gender	H1a	No	---	---	---	---
Age	H1b	No	---	---	---	---
Education	H1c	No	---	---	---	---
Computer self-efficacy	H2	No	---	---	---	---
Knowledge of system	H3	No	---	---	---	---
Relevance	H4a	No	H4b	Yes	---	---
Terminology	H5a	Yes	H5b	Yes	---	---
Screen design	H6a	No	H6b	No	---	---
Perceived shared benefits	H7a	Yes	H7b	Yes	---	---
PU	---	---	---	---	H8	Yes
PEOU (direct)	---	---	---	---	H9a	Yes
PEOU (indirect)	---	---	---	---	H9b	Yes

different variables that influence manager's use intentions, which expectedly impact their level of adoption and usability of these systems. Following the research main framework and its groups of variables, we discuss the results as follows.

Individual Differences

In contrast with our hypotheses and most of the prior research, all the individual differences that have been considered in the research model did not influence Bahraini managers' perceptions concerning ease of use of these systems. It is interesting to find that CSE was a nonsignificant factor in this study. This might mean that managers do not see technical or computer skills as a significant obstacle anymore. Supporting this argument, the degree of managers' knowledge of the system was found to not be statistically influential as well. Using computer systems in the past might have been difficult or at least require significant training in order to convince users to adopt them. Even for simple systems such as e-mail, word processing, and spreadsheets, prior research showed that sufficient computer skills were required (Agarwal & Prasad, 1999; Harrison & Rainer, 1992). At the present time, a new generation of managers who are immune from the difficulties of using ISs have taken over, and computer systems have become much easier than they were in the past. Moreover, using professional assistants to help managers in using advanced DSSs is one of the common ways for bypassing the difficulty of directly dealing with such systems (Turban et al., 2005).

Besides the technical skills, the results showed that demographic differences were also not statistically influential in this research. It seems that managers nowadays are more confident in using computers than they were in the past. Their intentions in using such systems do not differ whether they are old or young, male or female, having higher or lower degrees of education. One limitation for the finding concerning gender is that females represent only 19 % of the sample.

The previous findings simply suggest that implementation plans should not have different programs for enhancing system adoption according to such individual differences. This would save our time and efforts for other more significant factors.

System Characteristics

Not all three system characteristics had significant influence on TAM variables according to the results of this study. While system terminology had a significant effect on both PEOU and PU, system relevance had a significant effect only on PU. On the other hand, Screen design did not have any influence on either. These results suggest that the vendor of these packages should give more emphasis to the terms, language, and expressions that managers use in their decision-making activities, in order to enhance adoption levels of these systems. Although both screen design and terminology represent system interface, the results did not support the role of screen design on both TAM variables. This implies that what matters in these packages is the ability to reflect the language that managers use, and not imposing other technical or nonrelated terminology that might distract their use of these systems.

On the other hand system relevance was found to have influence on PU, but not PEOU. It seems logical to find this influence on managers' perceptions of the usefulness of the system, as relevance is more related to the content of the system—not to the interface, as in the other two system characteristics. This also supports prior studies concerning the effect of system relevance on system use (Venkatesh & Davis, 2000).

Perceived Shared Beliefs

Consistent to our hypotheses, we found significant support to our expectations that shared beliefs in the benefits of the decision tools of ERP systems affect TAM constructs. This finding is especially important as ERP systems are generally known for their transactional aspects. Managers need to know the specific benefits of these systems for decision making. If manage-

ment can take appropriate steps to positively influence the belief structure concerning decision-making activities of these systems, this will then lead to more acceptance of ERP systems by the organization's managers.

It is clear from the results that this factor—besides system terminology—was found to be the most important influential factor of the study. Implementation programs should then give more attention to these two factors. Training and communication programs should help form these shared beliefs. Managers should directly understand how ERP decision tools provide such benefits.

The findings of this study have implications for developing usable ERP systems for decision-making tasks. Considering the millions of dollars that have been invested in such systems worldwide, it is of paramount importance to ensure that managers will actually use them. In order to achieve this goal, attention must be placed in designing user-friendly interfaces that emphasize manager-familiar terminologies. At the same time, developers of ERP systems should keep in mind that, although these interface-related system features may appeal to users in the early stages, their final decision on whether to use a system or not, depend on the content of the decision tools of these systems. Specifically, it depends on how relevant these systems are to managers' decision problems.

On the other hand, implementation programs for these systems should have a strong training and communication scheme in order to provide clear understanding of the specific benefits of these systems to decision makers.

This research has several limitations. First, we did not incorporate actual usage behavior in the proposed model. However, this is not a serious limitation as there is substantial empirical support for the causal link between intention and behavior (Venkatesh & Davis, 2000; Venkatesh & Morris, 2000). Second, there may be other individual and external variables that may affect the intention to use these approaches. Future research can incorporate other variables into the research model. Potential individual differences include managers' cognitive styles and decision styles, which have been repeatedly used in TAM applications in previous cases (Harrison & Rainer, 1992; Hong et al., 2002). Some other contextual factors, such as IT capabilities, outsourcing, and degree of strategic focus have been included in relevant research studies (Bhatt, 2000). Future research can examine whether these factors have any influence on the acceptance of decision tools of ERP systems.

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APPENDIX A. SURVEY INSTRUMENT

The different opinions are indicated by the numbers 1: strongly disagree; 2: disagree; 3: somewhat disagree; 4: neutral; 5: somewhat agree; 6: agree; 7: strongly agree.

Perceived Usefulness (PU)

1- Using the system in my job enabled me to accomplish tasks more quickly.
2- Using the system in my job increased my productivity.
3- Using the system enhanced my effectiveness on the job.

Perceived Ease of Use (PEOU)

1- I found it easy to get the system to do what I wanted it to do.
2- It would be easy for me to become skillful at using the system.
3- In general, I would find the system easy to use.

Use Intension

1- I intend to use the system.
2- I intend to increase my use in the future.

Computer Self-Efficacy (CSE)

1- I could complete the job using the software even if there was no one around to tell me what to do.
2- I could complete the job using the software if I had only the software manuals for reference.
3- I could complete the job using the software if I had seen someone else using it before trying it myself.
4- I could complete the job using the software if I could call someone for help if I faced a problem.
5- I could complete the job using the software if someone else had helped me get started.
6- I could complete the job using the software if I had a lot of time to complete the required job.
7- I could complete the job using the software if I had just the built-in help facility for assistance.
8- I could complete the job using the software if someone showed me how to do it first.

Knowledge of the System

1- I am familiar with using the system.
2- I am knowledgeable in using the system to make my decisions.

Beliefs about using ERP system for decision support

1- The system enhances decision makers' ability to tackle large-scale complex problems.
2- The system shortens the time associated with making decisions
3- The system reduces decision-making costs.
4- The system encourages exploration on the part of decision makers.
5- The system enhances communication among decision-making participants.
6- The system improves coordination of tasks performed by an individual making a decision.
7- The system improves satisfaction with decision outcomes.
8- The system improves organizational competitiveness.

Terminology

1- I understand most of the terms used throughout the system.
2- The use of terms throughout the system is consistent.

Screen Design

1- The system commands are well represented by buttons and symbols.
2- The layout of the screens is clear and consistent.

Relevance

1- The resources in the system relate well to my work
2- The system has enough resources for my work

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