

Understanding the behavioral intention to use ERP systems: An extended technology acceptance model

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Abstract -Over the past few years, firms around the world have implemented enterprise resource planning (ERP) systems to have a standardized information system in their organizations. While millions of dollars have been spent on implementing ERP systems, previous research indicates that potential users may still not use them. This study, based on data from 75 potential end-users, examines various factors affecting users' behavioral intention to use the ERP system. The results indicate that subjective norms, perceived usefulness and education level are determinants of behavioral intention to use the system. In addition, perceived usefulness affects attitude towards use, and both perceived ease of use and compatibility affect perceived usefulness. Implications of these findings are discussed and further research opportunities described.

Keywords - Enterprise resource planning systems, technology acceptance, compatibility, subjective norms

I-INTRODUCTION

Over the past few years, companies look for ways of gaining competitive advantage against their opponents. In the past, when the focus was just producing as much as possible without considering exact demand [1], companies started to look for efficient ways to manage large inventories [2]. Enterprise Resource Planning (ERP) system is an integrated, customized, packaged software-based system that handles the majority of system requirements in all functional areas such as finance, human resources, manufacturing, sales and marketing [3], and is being used widely all around the world [4]. Although expectations from ERP systems are high, ERP systems has not always led to significant organizational improvements [5] and most of ERP projects become over budget, late and fail [6-10]. Previous studies indicate that ERP projects' failures are found to be the results of poor project communication [11], lack of top management support [12], existence of cultural differences [13], low user acceptance levels [14-16], inadequate integration of systems [12], user dissatisfaction [17] and inadequate training [18]. However, the failure of the ERP systems continues to increase and led researchers to find new solutions.

In this respect, Technology Acceptance Model (TAM), an adaptation of Theory of Reasoned Action (TRA) developed by [19], is a powerful, robust and commonly employed model for predicting and explaining user behavior and IT usage [20-22]. The original TAM consisted of perceived ease of use (PEOU), perceived usefulness (PU), attitude towards using (ATU), behavioral

intention to use (BIU) and actual use (AU). PU and PEOU are the most two important determinants of system usage and intention [23]. However, the original TAM model did not include social factors [24] and needs additional factors to provide an even stronger model [22].

Our review of the literature shows that there are a number of studies that have examined the user adoption of ERP systems with extended TAM. Reference [16] examined the influence of perceived usefulness, user involvement, argument for change, prior usage and ease of use on behavioral intention to use ERP systems. The results indicate that users' perception of the perceived usefulness, ease of use of the technology and the users' level of intrinsic involvement affect the intention to use technology. Reference [25] examined the influences of several independent variables (computer anxiety, prior experience, other's use, organizational support, task structure, and system quality) and one intervening variable (computer-efficacy) on the ERP acceptance level. The results show that user acceptance is strongly influenced by all independent variables and perceived usefulness. Reference [17] demonstrated what factors influence end-user satisfaction with ERP systems. The results indicate that both perceived usefulness and learnability are determinants of end-user satisfaction with ERP.

However, we were unable to locate any research attempting to examine the influence of perceived usefulness, perceived ease of use, subjective norms, compatibility, experience and gender on behavioral intention to use the ERP system.

II-RESEARCH MODEL AND HYPOTHESIS

The research model tested in this study is shown in Fig. 1. The following hypotheses were developed based on the findings of previous research on this subject.

Perceived usefulness

Perceived usefulness is the degree to which a person believes that using a particular system could enhance his or her performance [26]. Individuals who believed that using ERP systems could lead to positive outcomes also tended to have a more favorable attitude towards it. Also, there is an empirical support for the relationship between perceived usefulness and attitude towards use [27-29]. Therefore, we hypothesize:

H1: Perceived usefulness will have a positive effect on attitude towards use.

There is also an extensive research that provides the significant effect of perceived usefulness on

behavioral intention to use [27, 20, 30-37]. Therefore, we hypothesize:

H2: Perceived usefulness will have a positive effect on the behavioral intention to use ERP systems.

Perceived ease of use

Perceived ease of use is the degree to which a person believes that using a particular system is free of effort [26]. Previous studies have explained the effect of perceived ease of use on perceived usefulness [20, 38, 39]. Also TAM posits that perceived ease of use has a direct positive effect on attitudes towards using ERP systems [39-41]. Therefore, we hypothesize:

H3: Perceived ease of use will have a positive effect on perceived usefulness.

H4: Perceived ease of use will have a positive effect on attitude towards use.

Attitude towards use

Attitude involves judgment whether the behavior is good or bad and whether the user is in favor of or against performing it [42] and has a direct effect on the intention to use ERP systems in the future [40,43]. Therefore, we hypothesize:

H5: Attitude towards use has a positive effect on behavioral intention to use.

Compatibility

Compatibility is the degree to which the innovation is perceived to be consistent with the potential users' existing values, previous experiences and needs [44]. Reference [45] predicts consumer intentions to use online shopping and concluded that compatibility, usefulness, ease of use and security were significant predictors of attitude. Also, Reference [46] indicated that compatibility, perceived usefulness and perceived ease of use significantly affected healthcare professionals' behavioral intention. Therefore, we hypothesize:

H6: Compatibility will have a positive effect on attitude towards use.

H7: Compatibility will have a positive effect on perceived usefulness.

H8: Compatibility will have a positive effect on behavioral intention to use.

Subjective norms

Subjective norm is the "person's perception that most people who are important to him think he should or should not perform the behavior in question" [47]. Reference [48] found that perceived usefulness, opportunity for trial usage and result demonstrability have positive effect toward adopting iTV, and subjective norm has the greatest effect on BIU. Also the opinions of important referents could affect the person's feelings about the utility of the technology [49]. Therefore, we hypothesize:

H9: Subjective norms will have a positive effect on perceived usefulness.

H10: Subjective norms will have a positive effect on behavioral intention to use ERP systems.

Experience

Prior experience is a determinant of behavior [50]. Reference [51] compared the determinants of IT usage for experienced and inexperienced users, and inexperienced users placed a different emphasis on the determinants of usage and intention. Reference [52] found that computer experience and user training were positively related with perceived usefulness and perceived ease of use. Therefore, we hypothesize:

H11: Experience will have a positive effect on perceived usefulness.

Gender

Only gender is used as an individual user characteristic in our model. Reference [41] found that women's and men's perceptions of technology differ in that women view e-mail as being higher in social presence than men and women placed a higher value on perceived usefulness than men. Reference [36] investigated the gender differences in the relative influence of attitude towards using technology, subjective norms and perceived behavioral control in determining individual adoption. The results show that the decisions of men were strongly influenced by attitude towards using technology when compared to women decisions and women were more strongly influenced by subjective norms and perceived behavioral control. Also, Reference [53] found that age, education and income are associated differentially with beliefs about the Internet and these beliefs influence users' attitudes towards use and use of the technology. Therefore, we hypothesize:

H12: Women will place a higher value on perceived usefulness than men.

H13: Men will place a higher value on attitude towards using technology than women

H14: Men will place a higher value on behavioral intention to use technology than women.

III-METHODOLOGY

Procedure and participants

A survey methodology was used to gather data. A questionnaire was constructed based on an extensive review of the literature in the area of technology acceptance. Survey questions were adopted from previous literature and suggestions from academics. The target group was the potential ERP system users at a manufacturing organization. Questionnaires were returned from 75 of the 200 people who received them.

Questionnaire items

The questionnaire consisted of two main parts. The first part involved demographic questions designed to

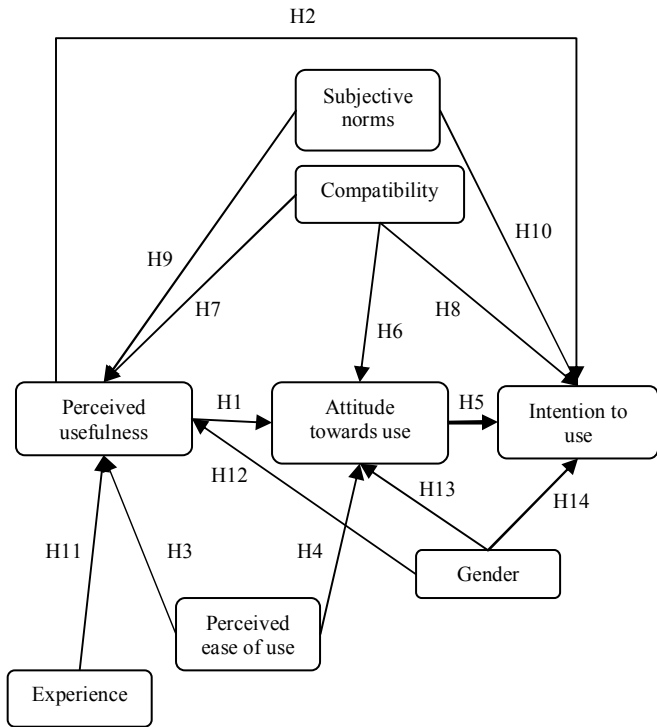


Fig. 1 Research model

solicit information about gender, age, level of education, working position, full time professional experience at the current position, full time working experience in a full time position. The demographic profiles of respondents are given in Table 1. The second part consisted of the items measuring the intention of the users, perceived ease of use, perceived usefulness, compatibility and subjective norms. A five-point Likert-type scale was used where 1=strongly disagree to 5= strongly agree.

IV-RESULTS

The psychometric properties of the instrument were evaluated in terms of reliability, Cronbach alpha [54]. Reliability was calculated for all multi-item variables. The entire instrument, as well as the individual variables, achieved high levels of reliability, as shown in

TABLE 1 DEMOGRAPHIC PROFILES OF RESPONDENTS

Age		
Max: 44	Min: 25	Average: 33.8
Gender		
Male : 75%	Female: 25%	
Education level		
Secondary school: 1.3 %	High School: 22.7%	
Graduate: 58.7%	MSc: 17.3%	
Position		
Middle management: 1.3%	Management: 9.3%	
Engineer: 54.7%	Other: 34.7%	
Work experience in the present company (month)		
Max: 174	Min: 6	Average: 59.8
Work experience in the present position (month)		
Max: 5	Min: 2	Average: 4.2

Table 2. Also the means and standard deviations of all variables are summarized in Table 2.

A multiple regression analysis was employed to identify which variables made significant contributions to predicting end-user intention to use ERP systems. The results of the analysis, including β coefficient, t-statistic, and significance level for each independent variable are reported in Table 3. Subjective norms, perceived usefulness and education level were found to be significant determinants of end-user intention to use ERP system, explaining 57% of total variance. The relative strength of their explanatory power was different. Subjective norms were much a stronger predictor of end-user intention as compared to perceived usefulness and education level.

A multiple regression method was also applied to find out variables influencing the remaining variables other than behavioral intention to use. The results show that, compatibility and perceived ease of use have direct positive effect on perceived usefulness, and perceived usefulness has a positive direct effect on attitude towards use. The results are presented as a conceptual model in Fig. 2.

V-DISCUSSION

This research examined the influence of subjective norms, compatibility, education level, perceived usefulness, perceived ease of use, attitude towards use and demographic characteristics on behavioral intention to use enterprise resource planning (ERP) systems. A conceptual model predicting user intention to use ERP systems was developed. The most

TABLE 2 DESCRIPTIVE STATISTICS AND CRONBACH'S α COEFFICIENTS FOR THE 20 ITEM INSTRUMENT

Variables	Mean	S.D.	Cronbach's α
Perceived ease of use (5)	3.55	0.49	0.81
Perceived usefulness (5)	3.92	0.71	0.89
Compatibility (3)	4.04	0.73	0.83
Subjective norms (4)	3.96	0.75	0.84
Intention to use (3)	3.96	0.78	0.89
Entire instrument (20 group items)			0.94

TABLE 3 MULTIPLE REGRESSION ANALYSIS

Dependent Variables	R ²	Independent variables	β	t	Sig.
Perceived usefulness	0.561	Compatibility	0.429	4.384	0.000
		Perceived ease of use	0.407	4.155	0.000
Attitude towards use	0.245	Perceived usefulness	0.495	4.868	0.000
Intention to use	0.570	Subjective norms	0.508	5.468	0.000
		Perceived usefulness	0.329	3.544	0.001
		Education level	0.202	2.513	0.014

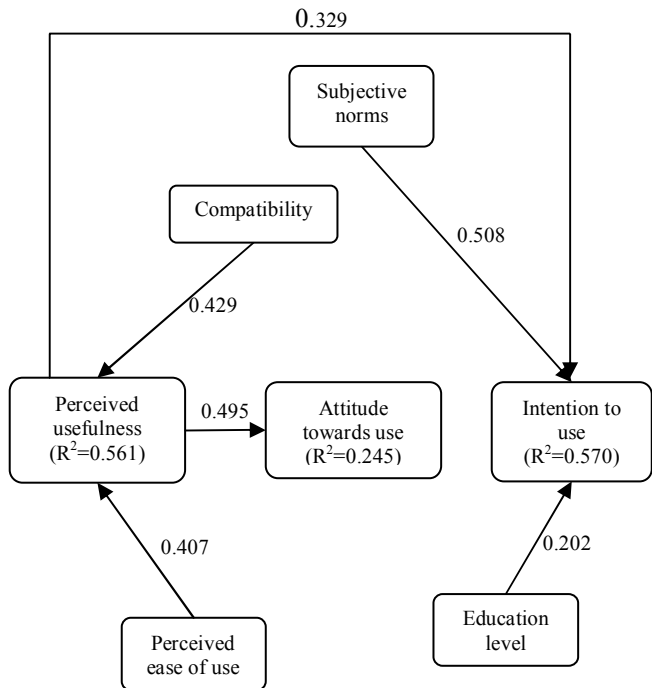


Fig. 2 A conceptual model of factors affecting behavioral intention to use ERP systems

noticeable aspect of this model is that perceived usefulness, subjective norms and education level are determinants of behavioral intention to use ERP systems. Among them, subjective norm has the strongest impact on behavioral intention. The results of this study confirm many of the findings of the earlier studies [48].

Perceived usefulness has a significant effect on intention to use ERP systems. A possible explanation for this finding came from the fact that participants who perceive that using ERP systems are useful also intend to use the system more frequently. Nevertheless, this finding is not consistent with those of [55], which have shown a negative impact of perceived usefulness on BIU.

Education level of potential users has a smaller but significant impact on users' intention to use ERP systems. As the education level of users increase, their intention to use ERP systems increases.

Another significant finding of this study relates to the effect of perceived ease of use on perceived usefulness. The importance of this factor is supported by previous studies [20, 38, 39]. This means that perceived ease of use also has an indirect effect on behavioral intention to use toward perceived usefulness. In other words, users intend to use the system more frequently as the system becomes an easy one to use.

Another noticeable aspect of the results was that compatibility has a strong impact on perceived usefulness. As the ERP systems are consistent with the potential users' existing values, previous experiences and needs, user perceive the system as more useful. This finding is consistent with those of [56], which asserted that the physicians would be more likely to take IT/IS usefulness

into account if they regarded it as being compatible with their current healthcare practices.

Although the findings of the present study contribute to a better understanding of the factors that effect behavioral intention with ERP systems, there are several limitations to this study. First, it should be noted that the model variables explained 57% of the variance on intention to use ERP systems. A large percentage of unexplained variance suggests the need for additional research incorporating potential unmeasured variables in the current study.

Second, the results of this study are far from reaching implications for other countries. A similar study examining this subject in an even broader sample of companies located in a variety of different countries could serve to further extend and enhance these findings.

Finally, a longitudinal research design is essential to confirm the linkages among the study variables.

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