A Proposed Model for Assessing the Determinants of Enterprise Resource Planning Adoption and Satisfaction

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Abstract

The complex information systems such as enterprise resource planning (ERP) systems are essential for organizations to make them competitive. However, the success of ERP system projects is a difficult process as it involves different types of end user assessment. The main objective of the present study is to find the key determinants that open the door to employee satisfaction and adoption of ERP system. This study conducted a survey method among sixty-three employees in Ferro Gilan Complex, Iran's first and largest private sector steel rolling company. Survey data were analyzed using the partial least squares (PLS) method while Smart PLS was used to test the hypotheses and to validate the proposed model. The results of this study indicated the determinants of ERP adoption and satisfaction. The study may also provide relevant evidence to organizations involved in the ERP implementation process in developing countries.

Keywords: Enterprise resource planning, behavioural intention, satisfaction

1. Introduction

The business environment changes rapidly and organizations face expanding markets, increasing competition, and rising customer expectations. To enhance business performance, organizations need an effective system that synchronizes planning of all processes. Enterprise resource planning (ERP) systems are regarded as one of the best information management systems for automation and enhancing operational efficiency [1] which provide seamless integration amongst disparate information systems in organizations for cohesive processes [2]. However, end users have negative attitudes towards the new information systems (IS). Making people use this time-consuming and costly investment is one of the most important issues to deal with. Therefore, assessing end user adoption and satisfaction is prominent.

In this study, the proposed model is developed by extending technology acceptance model (TAM) for evaluating the behavioural intention factors towards ERP and whether it is effective on creating, and if effective, to determine its degree of influence [3]. TAM, which was proposed by Davis [4], is the most referenced model in the area of research. This model is based on the theory of reasoned action (TRA) to predict and explain the behavioural intention of individuals in a specific situation. Meanwhile, DeLone and McLean [5] proposed IS success model as the main tool to evaluate the quality evaluation dimensions in relation to behavioural intention and satisfaction [6]. Although most ERP studies focused on factors affecting implementation, dearth of studies assesses the effects of quality evaluation dimensions (system–information–service) in relation to end user behaviour [1, 7].

The main focus of previous studies is system's technical aspects and the implementation phase success and neglecting themes like ERP system adoption [8-10]. The main driver for this adoption of ERP is to gain a variety of organizational, operational, managerial, and strategic benefits [11]. Moreover, the conclusions are mostly centered on a specific framework or model and fail to explain the relations between ERP user's adoption and satisfaction [10]. Therefore, the following research question for this study is: "What are the determinants of ERP adoption and satisfaction?"

2. The Proposed Model

As seen before, researchers often tend to use the TAM when studying ERP system's adoption. This model was considered to have a good fit explaining employees' adoption of IS and being a robust method for study's support [10]. Even though TAM is a well-established model applicable to variety types of technologies, it has been criticized for not providing sufficient information on individuals' perception toward novel systems [12]. Thus, the constructs of Technology Acceptance Model (TAM) need to be extended by incorporating additional factors such as main users, context, and the target technology should be taken into account when choosing additional factors [3].

Technology Acceptance Model

One of the most used models to study ERP adoption is the TAM. TAM has been extensively used to study individual technology adoption behaviour in numerous types of information systems. Many variables could explain the adoption of information systems (IS); however, two prominent constructs could be identified which are perceived usefulness and perceived ease of use which interact with external variables [13]. Perceived usefulness proposed to understand the degree of performance, whereas perceived ease of use is a measure for free of effort assigned [14]. According to TAM, perceived usefulness is influenced by perceived ease of use; therefore, individuals who perceive ease of use are more likely to believe in the ease and usefulness of the system [15]. Figure 1 illustrates TAM adapted from Davis [4].

TAM predicts that external variables are expected to influence behavioural intention to use IT indirectly [16]. Orlikowski [17] demonstrated that adopting and using specific IT is not solely dependent on the characteristics of the IT but is also dependent on other external aspects such as social or organizational context. Costa et al. [10] extended TAM According to the literature review using three main external dimensions which are system quality, management support, and training influence ERP adoption and satisfaction according to Figure 2.

ERP Adoption and Satisfaction Model

TAM is a fundamental model to explore the adoption of ERP technology. On the other hand, DeLone and McLean [5] proposed IS success model which assumes that system, information, and service quality indirectly affect organizational and individual impact through the reciprocally independent dimensions of behavioural intention/use and user satisfaction. This interdependent and multidimensional model has proven to be solid when explaining user's satisfaction as the most prominent factor when addressing IS success [6]. Therefore, this study selected external factors which are training, management support in

addition to system, information, and service quality as the determinants of ERP adoption and user satisfaction. The theoretical model of this study is presented in Figure 3.

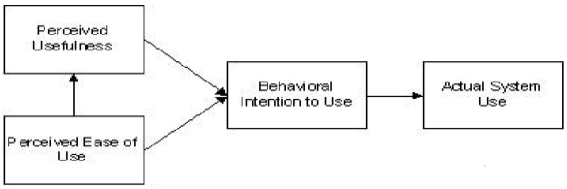

Figure 1. Technology acceptance model

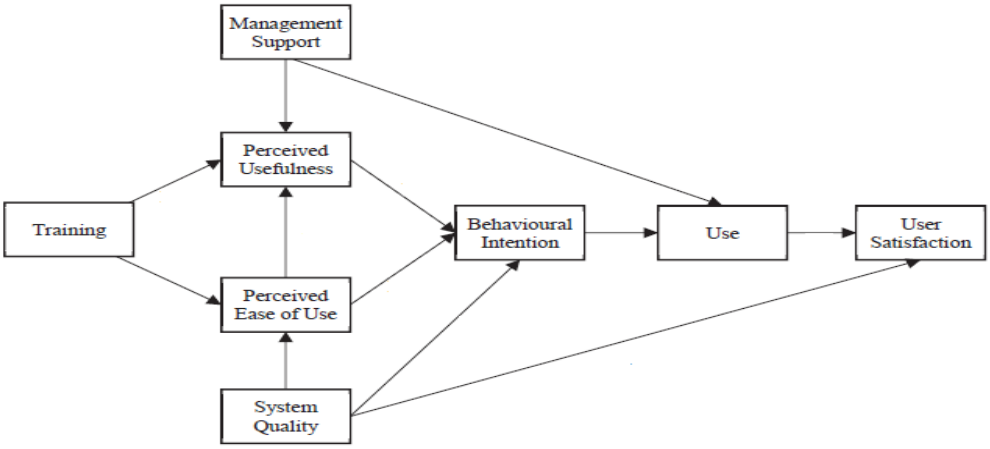

Figure 2. Extending technology acceptance model in ERP context

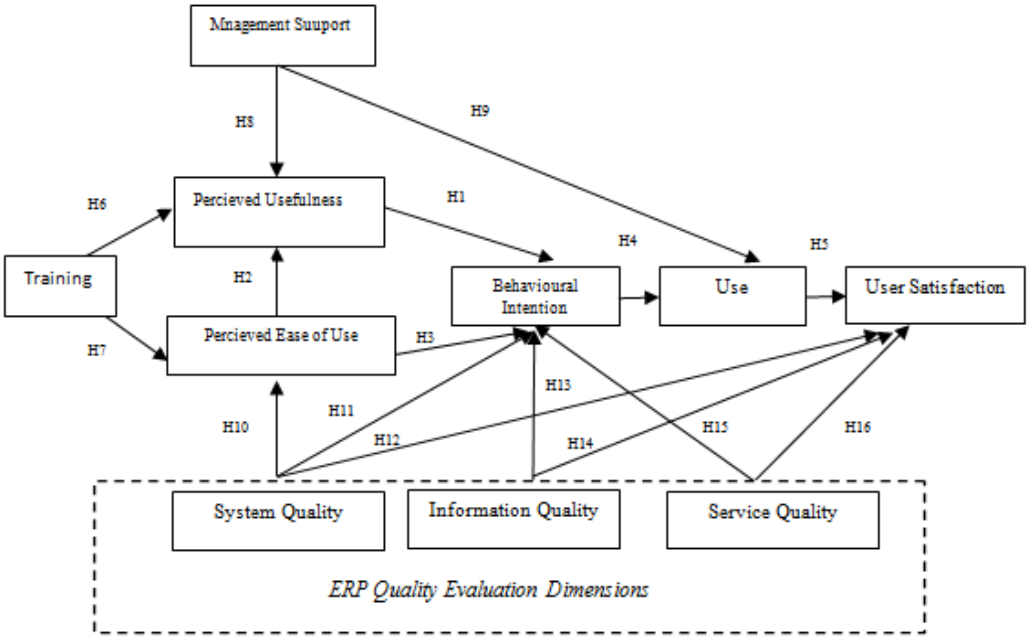

Figure 3. The proposed ERP adoption and satisfaction model

3. Method

Based on the research model and hypotheses, we included the following variables in this study: training, management support, perceived usefulness, perceived ease of use, system quality, information quality, service quality, behavioural intention, use, and user satisfaction. A 5-point Likert scale was adopted from Chou and Hong [1] and Costa et al. [10] for the evaluation. To ensure the content validity of the survey instrument, three experts with research experience in quantitative methods and scale development evaluated it.

After gaining ethnical approval from the company, paper-based questionnaires were distributed to employees between April and May 2017 based on purposive sampling. Seventy (70) questionnaires were distributed and seven were excluded as incomplete, giving a response rate of 90% eventually used for analysis. Thus, based on purposive sampling, 63 employees were included in the study. Table 1 provides the descriptive statistics of the sample.

Table 1
Demographic information of survey respondents

Demographic		Frequency (N=63)	Percentage (%)
Gender	Female	13	20
	Male	51	80
Age	<30	10	16
	30-40	43	67
	41-50	7	11
	>50	4	6
Education	Diploma	13	20
	College Certificate	15	24
	Bachelor's Degree	22	34
	Master Degree	14	22
Working Experience	Less than 1 year	3	5
	1-6	16	25
	6-12	24	37
	12-18	18	28
	More than 18 years	3	5

Smart PLS was used to conduct analysis in two main stages: (1) the assessment of the measurement model, including item reliability and convergent and discriminant validities, and (2) the assessment of the structural model. Smart PLS is most appropriate when a researcher is primarily concerned with the prediction of the dependent variable. Scholars now accept PLS as a powerful tool for evaluating a structural model [18].

4. Results

This section presents the findings organized as the measurement model (outer model) and structural model (inner model). A measurement model explores the relationship between a latent variable and its items, while, a structural model involves an assessment of the relationship between the constructs in a model.

Evaluation of the measurement model

Reliability concerns the extent to which a measuring procedure yields similar results on repeated trials. The reliability of the model was tested using composite reliability test. The results for the composite reliability ranged from 0.880 to 0.936, above the minimum recommended value. Therefore, the items used to represent the constructs were reliable.

Convergent validity is the extent to which a measure correlates positively with an alternative of the second construct [19], and to establish it, we needed to show that measures that should be related are in reality related. Convergent validity was tested using the average variance extracted (AVE), which should be greater than 0.5 for convergent validity to be confirmed [20]. Therefore, sufficient reliability and convergent validity were demonstrated, as shown in Table 2.

Table 2

Results of reliability and convergent validity tests

Constructs	Composite Reliability	AVE
Behavioural Intention	0.903	0.756
Information Quality	0.910	0.594
Management Support	0.936	0.746
Perceived Usefulness	0.905	0.705
Perceived Ease of Use	0.898	0.690
Service Quality	0.911	0.720
System Quality	0.920	0.657
Training	0.880	0.709
Use	0.911	0.774
User Satisfaction	0.935	0.784

Discriminant validity for these measures was also tested by evaluating the AVE and comparing the square root of its value to the latent variable's inter-correlations with other latent variables [20]. As the results in Table 3 illustrate, the square root of the AVE was greater than the latent variable inter-correlations with other latent variables. Therefore, sufficient discriminant validity was demonstrated.

Results of Testing the Structural Model

Once the construct measures are found to be reliable and valid, the structural model is assessed. This consists of testing the relationships between the constructs and the model's predictive capabilities. Validating the structural model can help researchers to consider systematically whether the hypotheses expressed by the structural model are supported by the data [21]. The structural model results are summarized in Table 4.

Table 3.

Results of Fornell–Larcker criterion test

	BH.INT	INF.Q	MSUP	P.USE	P.EOU	SRV.Q	SYS.Q	TRAIN	USE	USER.S
BH.INT	**0.87**									
INF.Q	0.58	**0.77**								
MSUP	0.61	0.55	**0.86**							
P.USE	0.48	0.63	0.51	**0.84**						
P.EOU	0.49	0.52	0.57	0.30	**0.83**					
SRV.Q	0.22	0.37	0.31	0.43	0.51	**0.85**				
SYS.Q	0.36	0.56	0.50	0.46	0.51	0.45	**0.81**			

TRAIN	0.33	0.13	0.29	0.40	0.16	0.15	0.21	**0.84**		
USE	0.56	0.71	0.48	0.61	0.47	0.56	0.55	0.27	**0.88**	
USER.S	0.16	0.43	0.37	0.54	0.39	0.45	0.32	0.18	0.41	**0.89**

*Note: Behavioural Intention= BH.INT, Information Quality= INF.Q, Management Support= MSUP, Perceived Usefulness= P.USE, Perceived Ease of USE= P.EOU, Service Quality= SRV.Q, System Quality= SYS.Q, Training= TRAIN, Use=USE, User Satisfaction= USER.S

Table 4

Results of structural model analysis

Hypothesis	Path coefficient	T- value	Result
Perceived Usefulness -> Behavioural Intention	0.186	1.088	Rejected
Perceived Ease of Use -> Perceived Usefulness	0.532	4.916	Supported
Perceived Ease of Use -> Behavioural Intention	0.451	4.199	Supported
Use -> User Satisfaction	0.579	2.945	Supported
Training -> Perceived Usefulness	0.104	1.394	Rejected
Training -> Perceived Ease of Use	0.314	2.851	Supported
Management Support -> Perceived Usefulness	0.344	2.850	Supported
Management Support -> Use	0.359	2.140	Supported
System Quality -> Perceived Ease of Use	0.594	5.616	Supported
System Quality -> Behavioural Intention	0.241	2.476	Supported
System Quality -> User Satisfaction	0.015	0.109	Rejected
Information Quality -> Behavioural Intention	0.214	1.626	Rejected
Information Quality -> User Satisfaction	0.113	0.514	Rejected
Service Quality -> Behavioural Intention	0.268	2.208	Supported
Service Quality -> User Satisfaction	0.181	0.937	Rejected

As can be seen in Table 4 training (β = 0.314, t value = 2.851) and system quality (β = 0.594, t value = 5.616) could influence on perceived ease of use and perceived ease of use (β = 0.532, t value = 4.916) has a significant relationship with perceived usefulness. On the other hand, perceived ease of use (β = 0.451, t value = 4.199), system quality (β = 0.241, t value = 2.476), and service quality (β = 0.268, t value = 2.208) are the predictors of Behavioural intention to use ERP system. The results also show that management support could influence on perceived usefulness (β = 0.344, t value = 2.850) and ERP use (β = 0.359, t value = 2.140) end ERP use (β = 0.579, t value = 2.945) could influence on user satisfaction. Figure 4 shows the results of the smart PLS analysis. The model, as presented in Figure 4, demonstrates 79% variance in Behavioural intention to use ERP system and 69% variance in user satisfaction.

Tenenhaus et al. [22] proposed a global evaluation criterion for model quality through the goodness of fit (GoF) which intend to account for the PLS model performance. The GoF index is obtained from the following equation is more than 0.36 which is high level for the PLS model performance at the measurement and structural model.

$$GOF = \sqrt{\overline{Communalities} \times \overline{R^2}} = \sqrt{0.713 \times 0.733} = 0.723$$

5. Discussion and Conclusion

Nowadays, ERPs are at the core of every competitive and modern business. Assessing employees' ERP adoption and satisfaction determinants as a multidimensional field of study is essential for every organization stakeholder. Successful ERP adoption leads to improved business efficiencies as a result of business process restructuring [23]. The present research integrates the dimensions from TAM, combined with the IS success model, and additional constructs which are training and management support. The presented model could offer a tool for assessing and predicting the adoption and employees' satisfaction of their ERP systems in developing countries.

The results of hypotheses testing indicated that training, management support, and perceived ease of use are the determinants that could influence on ERP adoption and satisfaction. Also, perceived ease of use, system quality, and service quality are the predictors of behavioural intention to use ERP system [10]. Moreover, management support could influence on perceived usefulness and employees' ERP use and ERP use is a predictor of users' satisfaction.

The result of this study is aligning with Liang et al. [24] that management participation positively affects the degree of ERP usage. Umble et al. [25] stated that successful implementations require strong commitment, leadership, and participation by management. Meanwhile, training refers to the process of providing employees with the logic and overall concepts of the ERP system which extremely complex and demand rigorous training [16]. The results of this study indicated that training could affect employees' perceived ease of use. Training could also provide managers with a mechanism to disseminate pertinent and useful information about the ERP system and how it fits in with the proposed and existing system [26].

The present study has some limitations. First, the sample data was collected from a private sector steel rolling company in Iran, but does not have a comprehensive and exhaustive industry-wide panorama. Therefore, the opposed model could be assessed in multiple case studies and other developing countries. Although the results are statistically relevant, further assessment with a larger territorial scope will enhance the model’s explanatory capabilities.

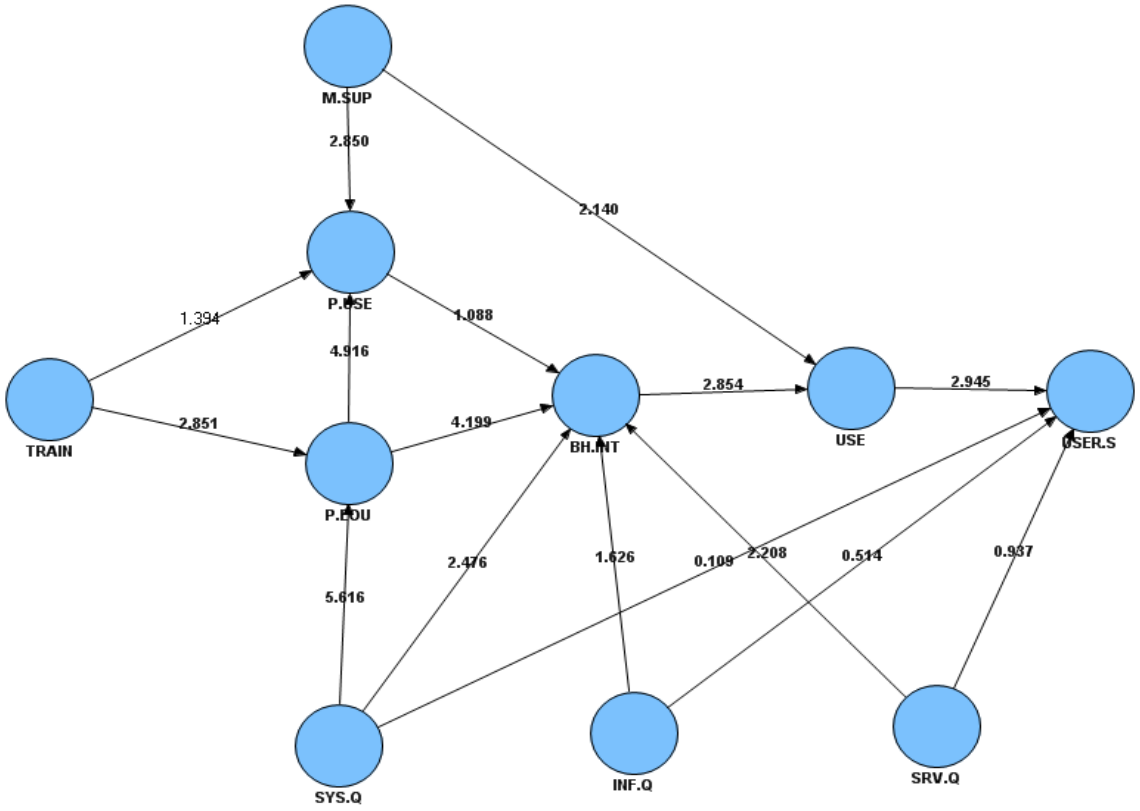

Figure 4. Results of the Smart PLS analysis

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