

An Investigation of the Enterprise Resource Planning Acceptance Drivers by Path Analysis

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Abstract

The aim of this study is investigation enterprise resource planning ERP acceptance drivers by using path analysis. A sample of 309 employees among employees of Iranian car production companies were selected randomly. The data were collected by questionnaire and then analyzed using path analysis method. The findings showed that organizational support has a significant effect on readiness for change, perceived ease of use, perceived usefulness, and intention to use the system. Moreover, organizational commitment and innovation orientation positively influenced readiness for change and, readiness for change positively influenced perceived usefulness and perceived ease of use is significant and positive. Finally, perceived ease of use has a positive impact on perceived usefulness and these two variables have a significant and positive impact on intention to use of ERP systems.

Keywords: ERP, ERP acceptance, model

1. Introduction

Many of managers and investors of corporations and organizations when implementing the organization resource planning system taking into consideration the infrastructure aspects, financial expenditures and also technical aspects assets and ignore other aspects and thus a context for the failure of the enterprise resource planning(ERP) projects is provided. According to Alshare and Lane (2011), the implementation of the most of the enterprise resource planning projects is not only occurred due to the lack of required investment in the infrastructure domain but also due to ignorance about the how the employees of the organization can accept it.

Based on recent investigations, more than fifty percent of ERP projects face failure (Brown, 2004; Barker and Frolick, 2003). But, apart from the importance of the expenditure and infrastructure facilities, perhaps the primary and the most important step to be taken to implement the ERP systems in the organization effectively, is the acceptance or rejecting it by the employees of the organization (Kwahk and Lee, 2008). Generally, the greater the quality and quantity of acceptance and use of ERP systems in the organization and company, the greater will be the efficiency of the ERP in the organization (Mangin et al., 2011).

Consequently, the lack of acceptance of the ERP systems from the side of workers will result in poor efficiency of these systems despite full provision for financial expenditures and technical facilities (Lee et al., 2010). To prevent such a failure, many researchers have considered and emphasized the problem of acceptance of the ERP systems by the workers from the point of view of approach, motivation and value variables (Lai and Li,

2005; Lai et al., 2010). However, there is domestic investigations in this field has been conducted. These factors have led us in this paper to compile and test conceptual model among car production company workers.

2. Background

From among relevant models, technology acceptance model (TAM), theory of reasoned action (TRA), and planned behaviour theory have had the most application in the field of studies of technologies acceptance such as ERP which will refer to it briefly. The theory of reasoned action was developed by Fishbein and Ajzen (1975), derived from previous research that started out as the theory of attitude, which led to the study of attitude and behavior. In this model, attitudes and subjective norms are main parameters in behavioral intentions. The planned model of expansion is the theory of reasoned action. In addition to attitudes and subjective norms, perceived behavioral control is considered as main factor in behavioral intention and behavior (Fishbein and Ajzen, 1975). The technology acceptance model (TAM) is presented by Davis (1989). In fact, this model is a simplified interpretation of the beliefs that influence technology acceptance. In this model, there are a series of external factors can have a strong effect on perceived usefulness and perceived ease of use. The theoretical basis of this model is based upon two beliefs, namely perceived usefulness and perceived ease of use. The perceived ease of use is related to the person's perception that using computer system does not need physical and mental attempts and is in fact very easy to use. Perceived usefulness is also related to person's perception that using a special technology results in the

up raise of personal functions (Davis, 1989). These two factors have affected on the attitude of individuals in using a technology, and lead to making intention in using the technology. The external variables in this model include some variables that can affect on these variables and promote the use of certain technology. The research background considered that some of these variables have been added to the mentioned models to achieve better prediction about exchange rates acceptance of ERP systems. For instance; Amoako and Salam (2004) in a research have investigated the study of acceptance of ERP systems in large companies such as; Coca-Cola, General Electronic, IBM Company, Dupont and Eastman. They also have considered the variables of technology acceptance model as the basis and variables such as communication in project, education ERP and belief are added to the project ERP benefits. They developed conceptual model by using path analysis and came to a specific conclusion that communication in project ERP and education ERP for users have significant effect on user's perception about the benefits of ERP systems. In addition, obtained findings indicated that when user's perception about the benefits of ERP systems improves, subsequently their perception about usefulness and ease of use in ERP systems will be upgraded and when such situation engenders between the users they will have more positive attitude toward ERP systems and finally they will be more inclined toward using ERP systems. Youngberg et al. (2009) in a research investigated the main factors on acceptance of ERP systems by staff. They developed conceptual model that perception of usefulness, subjective norms, and occupational variables were considered as exogenous variables and in this model, perception of the usefulness is an intermediate variable that can affect the use of ERP systems. His findings indicate that perceived ease of use has an intermediate role between the inclination to use, subjective norms variable and occupational variables. In addition, their findings indicate that if the personal perception of usefulness and ease of use of ERP systems improves, they will be more inclined to use this system.

Hong et al. (2011) have investigated the main factors in utilizing users of digital archiving systems by using technology acceptance model. By using a structural equation model, they concluded that the ease of use of these systems has affected the perceived usefulness and these two variables have a direct and positive impact on attitude toward use and also the intention to use. Moreover, Kwahk and Lee (2008) point out that the implementation of ERP systems in organizations is continuously changing. However; the implementation of the most of the ERP often faces failure, because they generally resist against changes. In such circumstance, readiness for change plays a vital role for success in implementing ERP.

Similarly, Bueno and Salmeron (2008) also in a research added variables such as top management support, communication, collaboration, education and technological complexity of the technology to the variables of technology acceptance model

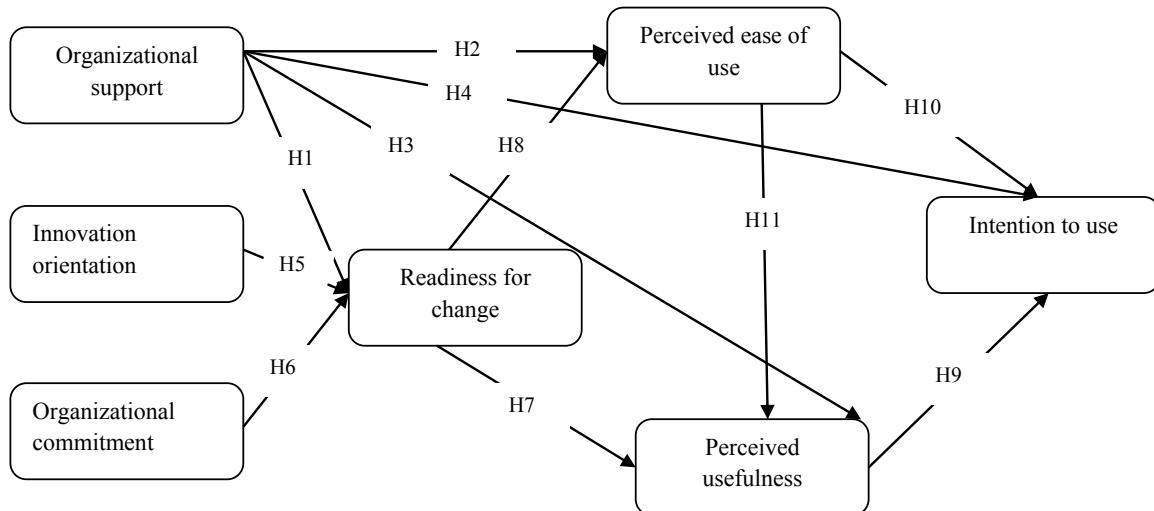
such as perceived usefulness, perceived ease of use, attitude toward and intention about using ERP systems. Their findings by using path analysis indicated that senior management support has an impact on communication and communication itself can affect cooperation among employees. In addition, education has a positive impact on the perception of ease of use and technological complexity has negative impact on this. The perception of ease of use has a positive impact on attitude to use, perceived ease of use and usefulness, also have a positive impact on ERP systems.

Xu et al. (2009) has also investigated ERP systems acceptance on the bases of technology acceptance model. They believe that performance expectations, social influence, and facilitating factors can be effective predictors of behavioral intention and behavioral intention itself can improve the inclination toward using ERP systems.

Calisir et al. (2009) in a research tried to predict the use of human resource planning systems with the help of behavior using subjective norms, consistency, experience, perception of usefulness and ease of use. Their findings indicated that consistency of predictive perception of ease of use is considered significant for attitude toward use. In addition, subjective norms, perceived usefulness and educational level, are considered to be significant predictors for willingness to use ERP systems. Kwak et al. (2011) in a research investigated the acceptance of enterprise resource planning systems by the final users in the project-based sectors. They have given more importance to support and counseling in this study and have divided it to two variables as consultancy support and internal support and have regarded them as exogenous variables which have a positive impact on subjective norms, perceived usefulness and perceived ease of use. Their findings suggest that when internal support for users of ERP systems increases, subsequently, their perception of ease of use and usefulness improves and these two variables also improve the willingness of users to use ERP systems. However, consulting support in this research had no significant effect on users of perceived usefulness, but with perceived ease of use have positive effect. Also, Sternad et al. (2011) in a research surveyed the effects of variables such as ERP systems user's support, ERP systems, education enterprise resource planning ERP systems, and innovation orientation on the perception of usefulness and ease of use and at the next level on the use of ERP systems. Their findings indicated that ERP systems user's support, ERP systems education and innovation orientation have significant effect on the ease and usefulness of these systems and also these variables have a significant effect on the attitude towards the use of and intention to use. Just as it was noticeable many researchers have used technology acceptance model as the basis and some has added variables affecting the ERP system to it. The variables which are common in the most ERP acceptance system models are inserted in the table 1 by the researchers.

Table 1. extracted variable for ERP acceptance model

researchers	organizational support	Innovation orientation	organizational commitment	readiness for change	perceived usefulness	perceived ease of use	intention to use
Amoako and Salam(2004)	✓				✓	✓	✓
Shivers-Blackwell, and Charles(2006)	✓	✓	✓	✓			✓
Wang et al(2006)					✓	✓	✓
Bueno and Salmeron(2008)	✓				✓	✓	✓
Kwahk and Lee(2008)		✓		✓	✓	✓	✓
Youngberg et al(2009)	✓			✓	✓	✓	✓
Scott and Walczak(2009)			✓	✓	✓	✓	✓
Lu et al(2009)					✓	✓	✓
Calisir et al(2009)		✓			✓	✓	✓

Fig.1. Conceptual model

H1. Organizational support positively influences readiness for change.

H2. Organizational support positively influences perceived ease of use.

H3. Organizational support positively influences perceived usefulness.

H4. Organizational support positively influences intention to use.

H5. Innovation orientation positively influences readiness for change.

H6. Organizational commitment positively influences readiness for change.

H7. Readiness for change positively influences perceived usefulness.

H8. Readiness for change positively influences perceived ease of use.

H9. Perceived usefulness positively influences intention to use.

H10. Perceived ease of use positively influences intention to use.

Hong et al(2011)			✓	✓	✓	✓	✓
Kwak et al (2011)	✓			✓	✓	✓	✓
Sternad et al(2011)	✓	✓	✓			✓	✓

Table1 showed that most popular variable which implemented in ERP systems acceptance models were organizational support, innfulness and intention to use.

3. Conceptual model and hypotheses

After reviewing relevant literature and components which have been extracted in table1 the conceptual model has been developed which encompasses seven variable included: organizational support, innovation orientation, organizational commitment, readiness for change, perceived ease of use, perceived usefulness and intention to use (figure 1). In this model, organizational support, organizational commitment and innovation orientation according to the literature have been considered as exogenous variables and readiness for change, perceived ease of use, and perceived usefulness as mediator variables. Moreover, intention to use ERP systems is dependent variable which other variables have direct or indirect influence on that.

4. Research methodology

4.1 Sampling

Statistical population of this study was staffs of car production companies in Iran. 313 people selected by random sampling method who worked with enterprise resource planning systems to perform their duties. Of the 312 questionnaires distributed, 309 questionnaires were returned and almost all of them participated in this research.

4.2 Research Instruments

Seven valid and reliable instruments which used to assess the constructs of research were adopted from previous studies.

Organizational support: Scale of organizational support were adopted from Lee et al. (2010) which consisted of 6 items and this items were measured using a five-point Likert-type scale which anchored ranging from “very high” to “very low”.

Innovation orientation: For measuring this construct we used the five items scale which developed by Lee et al. (2010). This scale was anchored ranging from “very high” to “very low” by using five-point Likert-type scale. Also, coefficient of cronbach’s alpha was 0.75, which indicates the appropriate reliability of this instrument.

Organizational commitment: to measure organizational commitment we adopted the instrument which developed by Kwahk and Lee (2008). This instrument consists of 6 items which anchored using five-point Likert-type. Reliability for organizational commitment scale was 0.87.

Readiness for change: Measurement of readiness for change was based on instrument of Kwahk and Lee (2008). This scale was anchored ranging from “very high” to “very low” by using five-point Likert-type scale and reliability for this scale was 0.75.

Perceived ease of use: Perceived ease of use was measured by using 5-items scale developed by Kwahk and Lee (2008). Reliability for Perceived ease of use scale was 0.90.

Perceived usefulness: to measure Perceived usefulness we adopted the instrument which developed by Calisir et al. (2009). This instrument consists of 6 items which anchored using five-point Likert-type. Reliability for organizational commitment scale was 0.85.

Intention to use: intention to use was measured by using 3-items scale developed by Kwahk and Lee (2008). Reliability for Perceived ease of use scale was 0.88.

5. Findings

For examining reliability and validity of research construct we performed confirmatory factor analysis and Cronbach’s alpha (tabale2). The main purpose of confirmatory factor analysis (CFA) is to confirm that the items on the research instrument measured the hypothetical constructs the survey intended to measure. The confirmatory factor analysis was conducted for the

seven constructs of research included: organizational support, innovation orientation, organizational commitment, readiness for change, perceived ease of use, perceived usefulness and intention to use. The significance of individual factor loading (λ) was examined using t-values. If the factor loadings are higher than .50, items are significantly loaded on their factors (Bagozzi and Yi, 1988). As table 2 showed all items have significant factor loading on their latent variables. Moreover, reliability testing of all construct by using Cronbach’s alpha revealed that all construct have acceptable reliability.

Table 2. Results of confirmatory factor analysis and Cronbach’s alpha

Construct	Cron-bach’s alpha	Factor loading						
		1	2	3	4	5	6	7
Perceived usefulness	0.85							
PU1		0.63						
PU2		0.78						
PU3		0.81						
PU4		0.65						
PU5		0.43						
PU6		0.51						
Perceived ease of use	0.90							
EOU1			0.91					
EOU2			0.88					
EOU3			0.75					
EOU4			0.49					
EOU5			0.87					
Intention to use	0.88							
ITU1				0.91				
ITU2				0.52				
ITU3				0.76				
Organizational commitment	0.87							
OC1					0.67			
OC2					0.75			
OC3					0.81			
OC4					0.74			
OC5					0.76			
OC6					0.74			
Organizational support	0.92							
OS1						0.85		
OS2						0.71		
OS3						0.59		
OS4						0.52		
OS5						0.73		

OS6				0.50		
Innovation orientation	0.82					
IO1					0.73	
IO2					0.82	
IO3					0.73	
IO4					0.51	
IO5					0.70	
Readiness for change	0.75					
RFC1						0.58
RFC 2						0.67
RFC 3						0.80
RFC 4						0.71
RFC 5						0.55
RFC6						0.60
RFC7						0.82

Table 3. results of model fit indices

Fit index	Accepted level	RFC	IO	OS	OC	ITU	EOU	PU
χ^2/df	≤ 5	3.75	4.63	1.32	4.01	2.41	1.78	4.07
(NFI)	≥ 0.90	0.96	0.93	0.99	0.94	0.93	0.95	0.90
(NNFI)	≥ 0.90	0.93	0.90	0.96	0.90	0.91	0.95	0.95
(CFI)	≥ 0.90	0.95	0.93	0.99	0.98	0.90	0.96	0.93
(GFI)	≥ 0.90	0.93	0.93	0.98	0.93	0.95	0.93	0.94
(AGFI)	≥ 0.90	0.90	0.95	0.91	0.92	0.93	0.90	0.90
(RMSEA)	≤ 0.08	0.062	0.059	0.049	0.067	0.023	0.050	0.061

Correlation matrix of all measured variables appears showed in table 4. The correlation matrix results reveal high significant relationships between perceived ease of use and organizational support ($r = .53$, $p < .01$), perceived usefulness and organizational support and also significant correlation between organizational support and intention to use ($r = .70$, $p < .01$). Moreover, readiness for change has a highly significant relationship with both perceived ease of use ($r = .37$, $p < .01$) and perceived usefulness ($r = .44$, $p < .01$) and relationship between perceived usefulness and perceived ease of use with intention to use is positive and significant. Finally, associations between organizational support and readiness for change ($r = .17$, $p < .01$) organizational commitment and readiness for change ($r = .16$, $p < .01$) and between innovation orientation and readiness for change ($r = .23$, $p < .01$) are significant and positive.

Table 4. Correlation matrix research variables

Variables	1	2	3	4	5	6	7
1-Organizational Support	1						
2-Organizational Commitment	.16**	1					

Table 3 shows the summary of model fit indices for seven construct of research. There are many criteria for accepting the model fit, but this study adopted seven popular criteria: χ^2/df which divided chi-square to the degree of freedom, the Goodness of Fit Index (GFI), the Adjusted Goodness of Fit Index (AGFI), the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), the Normalized fit Index (NFI) and the Non-normalized fit Index (NNFI). As Kline(2005) mentioned the acceptable level for GFI, AGFI, CFI, NFI and NNFI indices is ≥ 0.90 and for χ^2/df and RMSEA indices is ≤ 5 and ≤ 0.08 respectively. Results of Table 3 showed that all the fit Index of research construct satisfied the general criteria for good-fitting models.

3-Innovation Orientation	.043	.32**	1				
4-Readiness for Change	.17**	.24**	.23**	1			
5-Perceived Ease of Use	.53**	.15**	.011	.37**	1		
6-Perceived Usefulness	.56**	.16**	.023	.44**	.78**	1	
7-Intention to Use	.70**	.10	.08	.13**	.61**	.67**	1

As figure 2 showed path analysis was conducted to examine the model and also hypothesize. Path coefficients and their significant levels have been mentioned in figure 2.

Table 4 reveals the direct, indirect, and total effects among organizational support, innovation orientation, organizational commitment, readiness for change, perceived ease of use, perceived usefulness and intention to use. As table 4 showed that organizational support directly and positively influenced on intention to use ($\beta=.47$ $p < .01$), perceived ease of use ($\beta=.49$, $p < .01$), perceived usefulness ($\beta=.21$, $p < .01$) and on readiness for change ($\beta=.15$, $p < .01$). Innovation orientation and organizational commitment have direct and significant effect on readiness for

change ($p < .01$). Moreover, readiness for change influenced on perceived ease of use ($\beta = .29$, $p < .01$) and perceived usefulness ($\beta = .19$, $p < .01$). On the other hand, results showed that perceived ease of use and perceived usefulness directly and positively influenced on intention to use. Thus, with respect to the predicted paths we could conclude that the all 11 research hypotheses were generally supported in regarding to results.

Fig.2. model testing results (* $p < 0.05$ and ** $p < 0.01$).

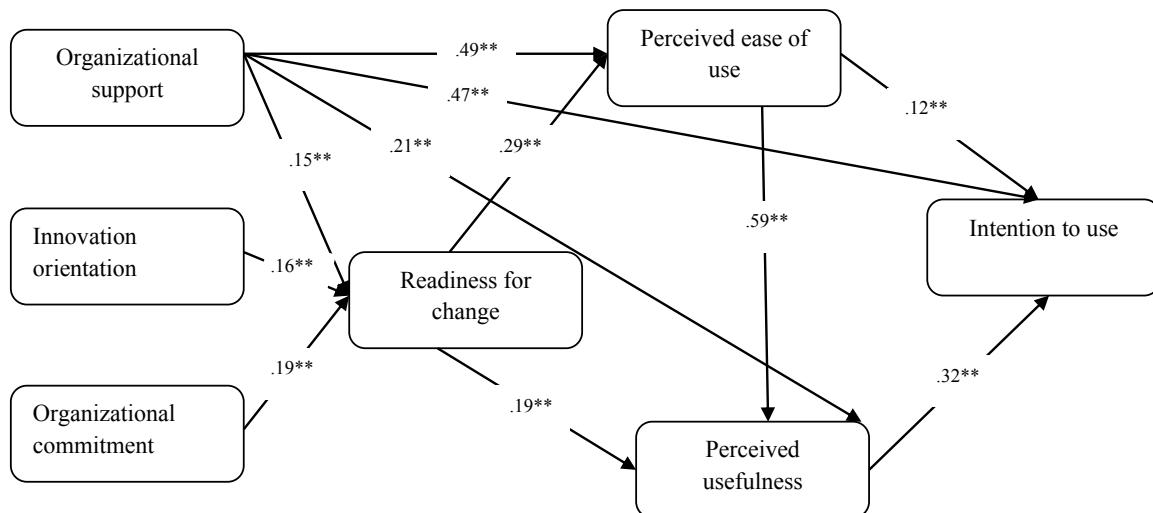


Table 5. Results of direct effect, indirect and total effects

Path	Direct Effect	Indirect Effect	Total Effect
To Intention to Use			
Perceived Usefulness	.32**	-	.32**
Perceived Ease of Use	.12**	.19**	.31**
Readiness for Change	-	.15**	.15**
Organizational Support	.46**	.24**	.70**
Organizational Commitment	-	.02**	.02**
Innovation Orientation	-	.03**	.03**
To Perceived Ease of Use			
Readiness for Change	.29**	-	.29**
Organizational Support	.49**	.04**	.89**
Organizational Commitment	-	.05**	.05**
Innovation Orientation	-	.06**	.06**
To Perceived Usefulness			
Perceived Ease of Use	.59**	-	.59**
Readiness for Change	.19**	.17**	.06**
Organizational Support	.21**	.34**	.07**
Organizational Commitment	-	.06**	.06**
Innovation Orientation	-	.07**	.07**
To Readiness for Change			
Organizational Support	.15**	-	.15**
Organizational Commitment	.16**	-	.16**
Innovation Orientation	.19**	-	.19**

* $p < 0.05$ and ** $p < 0.01$

Table 6 showed that fit indices satisfy the general criteria for a good-fitting model ($\chi^2/df = 3.41$, RMSEA = 0.079, NFI = 0.97, NNFI = .94, CFI = 98, GFI = .98 and AGFI = 0.92) and the examined model did match the theoretical expectation

Table 6. Indexes of model fit

Indices	x/df	RMSEA	CFI	GFI	NNFI	NFI	AGFI
Acceptable level	≤ 5	≤ 0.08	≥ 0.90				
Estimated level	3.41	0.079	0.98	0.98	0.94	0.97	0.92

6. Discussion and conclusion

The aim of this study is to present a model for the acceptance of enterprise resource planning systems among the employees of car production companies using path analysis. Based on the research and theoretical literature of important variables in the areas of ERP system has been identified and have been placed in the model based on the literature. The results indicated that organizational support has a significant effect on readiness for change, perceived ease of use, perceived usefulness, and intention to use the system. These findings are compatible with the findings of Bueno and Salmeron (2008), Youngberg et al. (2009), Kwak et al. (2011), and Sternad et al. (2011). Therefore, when car production companies provide training courses for their employees in order to make better use of ERP systems, encourage and support their staff to use ERP systems in their business activities continuously, and also emphasize over the satisfaction of their employees in the use of ERP systems, can subsequently improve their staff's Perception toward the ease of use, usefulness and intention to use ERP systems. Kwak et al. (2011) believe that employees who feel encouragement and support from their manag-

ers and organizations to use ERP systems, will feel that the use of ERP systems is easy and beneficial in work activities and, so they subsequently become more willing to use ERP systems. Other findings indicated that the effect of organizational commitment and innovation orientation is significant on readiness for change that can be noted that these findings are compatible with the findings of Kwahk and Lee (2008), Scott and Walczak (2009). Staff commitment to the organization has a vital role in the success of organization. Moreover, employees who consider their identity related to their organization are satisfied with their membership and participation in the organization and loyalty to its values and goals and accept the changes occurring in their organizations easier, because they consider changes advantageous for themselves and their organizations (Madsen et al., 2005; Kwahk and Lee, 2008). In addition, employees who find innovative solutions to solve problems and accept challenging duties and assignments and take risks are assumed to be more flexible and readier to face changes (Synder-Halpern, 2001). In these situations, car production company managers can increase their employee's inclination toward innovation by creating open organizational atmosphere and culture and accepting new ideas and providing opportunities to test and thereby improve their willingness to make minor changes or implement new technologies such as ERP systems.

Other findings of this study indicated that influence of readiness for change on perceived usefulness and perceived ease of use is significant and positive. In other words, when employees have a high willingness to accept the changes consequently, their perception about perceived usefulness and perceived ease of use of ERP systems will be high. These findings are compatible with the findings of Kwahk and Lee (2008). Readiness for change is among the features that minimize the staff's strength in acceptance of technology such as ERP systems and, on the other hand; it will improve their perceptions and beliefs regarding the usefulness and benefits of these technologies. Other findings of this study suggest that perceived ease of use has a positive impact on perceived usefulness and these two variables have a significant positive impact on the intention to use. Therefore, it can be conclude that obtained finding are compatible with the findings of kwak et al. (2011), Hong et al.(2011), Calisir et al. (2009), Scott and Walczak (2009), Kwahk and Lee (2008), and Amoak and Salam (2004). Perceived ease of use is subjective impressions of users from the easy use of an information technology dependent system like the ERP system. When such situation happens, members deem the use of the system beneficial. On other hand, understanding the usefulness of the system influenced by the fact that he understands it is easy and simple to use a particular technology.

In addition, if a new technology requires less effort to be learnt and used, it will be more utilized. In such circumstances it must be said that whatever system is simpler and more useful for users, it will probably be more utilized and applied by them. Finally, managers and officials of the car production com-

panies should pay attention to this fact that first with support and backup, creating open areas for the occurrence of innovations of employees and also with creation of their loyalty and commitment to the organization can improve a readiness for change in staffs and subsequently upgrade their understanding from the usefulness and ease of use of the system so they can finally be able to efficiently improve the accept and willingness of the staff toward ERP systems.

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