

A Study of Unified Theory of Acceptance and the Use of Technology in Iranian Organization: Case Study of Cement Factories

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Abstract: The study of IT adoption models indicates that many competitive models have been presented and each one holds various sets of determinants. In this research, user admission has been studied in Iran through applying Unified Theory of Acceptance, Technology adoption (UTAUT) and its points (2003) which are the outcome of integration of structures related to eight widely used models in the area of technology adoption. This study has been conducted based on collected data in the first half of 2014 out of a sample consisting of 86 directors and experts of four concrete complexes in Qeshm, Ardestan, Darab and Kerman. The outcomes of the data analysis gathered from these four administrations through applying “Path Technique” demonstrated that “Effort Expectancy” and “Social Influence” variants has a significant correlation with the behavioral intention of applying technologies. In addition, there is a significant correlation between “Facilitating Conditions” and use behavior. Furthermore, the results demonstrate that the relationship between “performance expectancy” with “behavioral intention” is stronger for men than women. “Effort Expectancy” and “social Influence” as well as “behavioral intention” is stronger for women compared with men. However, the relationship between “performance expectancy” variable with “behavioral intention” was not approved. Generally, the result of this study shows that the UTAUT is a reliable and strong model for anticipating the behavioral intention and use behavior in IT systems adoption in our country too.

Key words: Information technology application, information systems acceptance, application behavior, the Unified Theory of Acceptance and Use Technology (UTAUT)

INTRODUCTION

Information and communication technology, refers to technologies including the internet, intranets, extranets and other technologies that cover a wide range of basic infrastructure to technologies that improve an organization’s services and performances (Gupta *et al.*, 2008).

Development and application of information technology in various areas from IT capabilities that today’s business world is faced with great enthusiasm. Understanding the causes and circumstances that led to the adoption of information technology in these areas are important research in the field of information technology. So far, various models and methods to investigate factors affecting the adoption of information technology have been used from which the technology acceptance model theory of acceptance and use of technology was the most creditable one. IT is correlated with almost every aspect of our lives, especially with our professional life.

Application of information technology in different areas and the rapid growth of use of computers by the organizations makes the study of rate and factors of acceptance or rejection of the IT in organization important (Ghorbanizade *et al.*, 2011). Admission Fusion theory and application of Technology (UTAUT) is a result of a combination of eight proposed pattern of technology adoption (including technology acceptance model, theory of reasoned action, models of personal computers, model theory of planned behavior, theory of diffusion of innovation, social cognitive theory motivational theory and the theory of acceptance of social technical systems) which has been presented. Today, technology and its evolutions has become one of the most important elements in the strategic environment of organizations. Some researchers believe that knowing the effects and consequences of the IT system of economic, social and even political systems are far more important than the development of this technology in the development of science knowledge in the field of LED technology

(Chanaron *et al.*, 2002). Undoubtedly, the move towards new technologies for enterprises is undeniable. The organizations must analyze all aspects of technology utilization to their organization which would be accomplished by applying acceptance technology model that can examine the matter thoroughly and from various aspects. Technology acceptance by users is one of the most important factors in success of a technology. In case of users' refusal or debility in acceptance of technology, the abilities and features of system declines and contributes to resources loss. In addition, the acceptance of new technologies will not happen immediately yet, it is a process that shapes over time and if used consistently and routinely, a successful reception takes place.

Many organizations considering strategies and the need for their organizational structure without any knowledge and detailed understanding of the influential factors in successful deployment of a new technology due to their unfulfillment of managerial and organizational goals, despite the incurred costs, start changing and replacing the information systems with new information systems. Effective parameters are ignored due to lack of sufficient knowledge towards factors. In choosing and applying the new technology, so the new technology cannot assist completely the promotion of intelligent business systems and intended goals in organization. In recent decades, in proportion of information technology advancements and its application in various areas, several models and patterns in the field of technology acceptance have been created. The results of conducted studies show that these models have different functions in the field of studying various technologies and its acceptance.

IT effectiveness of the technology has a positive correlation with its acceptance. If the potential users of this technology resist against its application, the desired objectives cannot be achieved. Therefore, it is important to understand why users accept or reject the application of technology. If the influential factors of information technology adoption are identified and understood, this makes it possible that more efficient IT systems to be designed and in this way, the possibility of its acceptance by users increases (Ghorbanizade *et al.*, 2011). Different Models and theories have explained the effective factors of information technology acceptance but Venkatesh *et al.* (2003) who are considered important pundits in the field of information systems studies offered the consolidated comprehensive theory of acceptance and (UTAUT) information technology application through a comprehensive study in an accredited magazine by name MISQ and studied the mentioned model in America. Therefore, the basis of this study is the combination theory of acceptance and application of

(UTAUT) technology in which the relationship between the structures of the research pattern that means the desire for using technology and facilitator condition with variables of behavioral intention as well as the role of mediators in technology application behavior is evaluated. The research hypotheses which are based on theoretical model frame of the study are presented considering the role and limitations and studied in subjected firms and organizations. Therefore, the research questions of the study are as follows. What are the effective factors on the adoption of brand new information systems and technologies by users in the organization (cement companies)? Is the combining theory of the adoption and technology application (UTAUT) by Venkatesh *et al.* (2003, 2008) in compliance with Iranian organizations?

Review of literature: Now a days, the presence of computer and information technology in organization is increased widely. Considering the estimated factors from 1980s almost 50% of organizations investments has been on information technology (Westland and Clark, 2000). Nonetheless for a technology to be developed, it is supposed to be accepted and applied by the employees of the organization. Explanation and elaboration of users acceptance of a new technology is one of many models of study of the age in literature of information technology system (Hu *et al.*, 1999). During last two decades a great part of management information system studies has been concentrated on recognition of different factors affecting acceptance behavior and applying a technology. This leads to formation of various theoretical models in this field from which the most recognized and applicable is Vanktashs compound theory of acceptance and technology adoption.

The UTAUT theory is the result of integration of proposed eight models, Technology Acceptance Model (TAM), Theory of Reasoned Action (TRA), Motivation Model (MM), Personal Computer Utilization Model (PC utilization), Theory of Planed Behavior Model (TPB), Innovation Diffusion Theory (IDT), Social Cognition Theory (SCT), Scientific System Theory of Acceptance (SSTA), in field of technology acceptance.

Venkatesh *et al.* (2003) after a comprehensive study and analysis of models presented in this field, in their experimental study considered data related to employees of four organizations during 6 months in three stages of time (first stage: after training, second stage: The 1 month after application and third stage: The 3 month after application) in order to study and approve this model. The real utilization behavior was evaluated after six months of training as a treatment. All eight models could explain between 17-53% of behavior intention variance then the compound theory of acceptance and technology

utilization was tested using the gathered data. The result of test indicated that the performance of the mentioned theory is better than other eight models and can explain 69 % of technology utilization intention variance.

Review of empirical studies: So, many researches and studies on information technology acceptance have been conducted in Iran; here we refer to some of them. Ghorbanizade *et al.* (2011) in a research titled as: Meta-analysis of factors affecting adoption of information technology in Iran, studied the rate of various effective factors on information technology acceptance in Iranian organizations. The result of this study indicated that most of the researchers in Iran use the third model of technology acceptance known as TAM. The reason for acceptance this model more than other models is because it's logical, understandable and its easy application in organizations. Therefore, for organizations who are interested in getting involved in research studies related to field of information technology, it's suggested to use this model. Considering the intensity and effectiveness of obtained result of capacitating variables in employees, range of utilization, organizations co-operation in information technology utilization, organization structure, accuracy and concentration in making decisions, the limitation of dominion of supervision and formality descent, mental cognition of easiness and usefulness should be paid more attention by organizations. In studying the researches done by the researcher, a little attention was dedicated to recognition and effects of mediator and sociology variables which are observable in Iranian organization structures and if this attention increases in the organizations they can reinforce the share of knowledge in their employees.

In other research, Akbareyan and Eskandari (2011) designing and presenting a model for accepting electronic tax assertion they studied the effective factors on acceptance of government electronic services, digital economy and electronic assertion system in Iran with analyzing current scientific models and theories including Unified Theory of Acceptance and Utilization of Technology (UTAUT) and the model of desire to use electronic tax assertion which are its most important factors. Finally, evaluating the proposed model by the questionnaire and regressive, it's been concluded that at the current situation the effective factors in accepting electronic tax assertion are the supporting conditions. In addition to this the other factors effecting interest of using this service are: effort expectancy, social influence and performance expectancy. Furthermore, it's been indicated that the digital signature variable has a positive and logical effect on performance expectancy variable but

it doesn't have a logical effect on effort expectancy variable. Technical and fundamental variable has a positive logical effect on effort expectancy and performance expectancy. Yaghobi *et al.* (2011) conducted a research titled: identifying and analysis the factors affecting the adoption of internet banking service, using the Unified Theory of Acceptance and Utilization Technology (UTAUT) and emphasizing on adjusting role on gender variable and testing the hypotheses of the research achieved from 399 Iran Meli Bank clients living in Tehran. The obtained result from analyzing the data using Lisels course analyzing method indicated that all 3 factors of acceptance related to performance, effort and social affects have a significant correlation with costumers' intention of adoption internet banking service. Also, the adjusting role of gender variable on relations existed in the research model was approved. Hasan Pornorozi and Chakali in a research entitled: factor influencing on adaption of sound digital archive by Iran sound broadcasters in Northern west part of the country using Davis acceptance model (TM) on a society consisting 100 participants of Iran sound broadcasters, identified Davis models important factors including mental conception of usefulness, mental conception of ease of use, attitude toward adoption and decision to adopt technology as factors effecting accepting digital archive by Iran sound broadcasters. In their point of view, the technology of a co-operative company shows its set of capabilities, this definition emphasizes technology strategy is organizations pivot whether its strategy pivoted or not, whether its manufacturer of products or offers innovative services or a follower. Nevertheless, today, it is accepted that technology considerations should be included in business strategy in appropriate way. Technology strategy is adopted as a basis for making business strategic decision (Olfat *et al.*, 2011).

Furthermore, Gupta *et al.* (2008) studied the adoption of information and communication technology in Indian government organizations based on unified theory of adoption and utilization technology. The result of this study demonstrated that performance expectancy along with expectancy of effort, social effects and facilitation condition have a significant correlation with information and communication technology utilization and adoption. In this study, the adjusting effect of gender variable on relations in the presented model was not significant. The result of research done by Chang *et al.* (2007), studying the physicians' acceptance of pharmacokinetics-based clinical decision support systems based on unified theory of adoption and utilization technology demonstrated that both effort expectancy variables have a significant relation with technology adoption intention also the

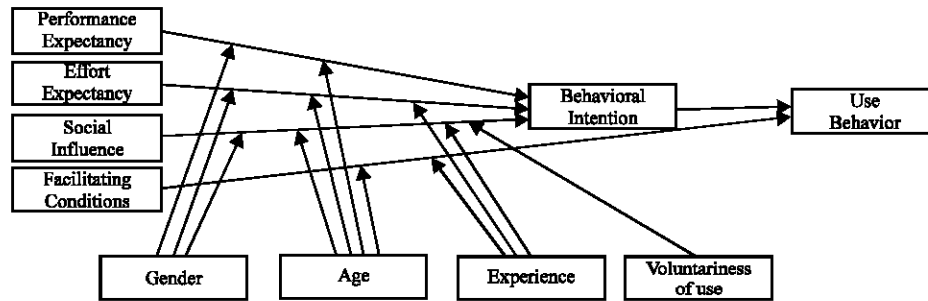


Fig. 1: Research model

correlations between social influence and adoption intention as well as co relation of facilitating condition and adoption behavior were approved. Technology strategy is a plan which conducts the decisions of a firm on adopting the capabilities of technology (Kearns and Sabherwal, 2006). Spital and Bickford (1992) consider the technology strategy as a set of strategic 1decisions and necessary enterprises by directors for changing income to outcome with the intention of achieving competitive advantage (Vanktash *et al.*, 2008). Also so, Ford and Saren consider technology strategy a set of obligations and activities for creating, reserving and getting revenue from investments of a company's technology. Anderson and colleagues, applied UTAUT to specify the motivating and adjusting factors of adopting tablet pc in business college. The results of the research approved, the validity of the factors of the model and the variable of performance expectancy was recognized as the most important motivating factor in acceptance. Also, Karlson and colleagues used the same theory to explain acceptance of mobile technology and services in Finland. The result of their study demonstrated that the performance expectancy and effort expectancy have significant correlations with intention factor but social influence factor doesn't have a significant relationship mentioned services adoption intention (Yaghobi *et al.*, 2011).

Research significant design: Regarding the explanations presented here and according Vanktash's research model this research model is presented as bellow. In this model (Fig. 1) four factors of performance expectancy, effort expectancy, social influence, facilitating conditions and roles of modifying variables of gender, age, experience and voluntariness which seem to be the most important direct determinants in interest or adoption, in research model have been studied.

Variables definition: Different variables have been presented in above model which will be more specified by definition:

- Performance expectancy: the extent to which a person believes that adopting a system would help him achieve his professional goals
- Effort expectancy: it's been defined as the ease of use a system
- Social influence: the extent to which a person thinks that effective and important people on his behavior believe that he should adopt the new system
- Facilitating conditions: the extent to which a person believes that organizational and technical basis for supporting the adoption of the system is at hand
- Behavioral intention: it shows how much each user intends to use a system
- Use behavior: the actual adoption of a system, the number of times a user uses a system and how long he keeps working with the system each time he uses it

Research hypotheses:

- H₁: the effect of expected performance on the intention (to use or IT system) is positive
- H₂: the efforts expectancy has a positive impact on the on the intention (H₂)
- H₃: social influence has a positive impact on behavioral intention (H₃)
- H₄: facilitating conditions has a positive impact on use behavior (IT or system) (H₄)
- H₅: the impact of performance expectancy on application behavior of men, especially young men compared to women is stronger (H₅)
- H₆: the impact of efforts expectancy on applying behavior for older women compared to men is stronger in the early stages of experience (H₆)
- H₇: the effect of social influence on the use behavior of the application for older women compared with men in the early stages of the experience stronger (H₇)
- H₈: behavioral intention has a significant positive impact on the behavior of the application (H₈)

MATERIALS AND METHODS

The aim of the present study is considered practical and from data collection aspect is a descriptive survey. Data analysis has been conducted through partial least squares analysis techniques (structural equation modeling) and using PLS2 software. The statistical population of this research consists of managers and experts of cement companies namely Qeshm, Adestan, Fars and Kerman. These people are considered as the statistical population of this research based on their responsibility and role in using various IT systems with regard to the organizational positions they held were included 110 people.

Simple random sampling method is conducted based on Morgan Table. But because of better extension and this issue that some questionnaires were likely not to be returned, 120 questionnaires were distributed and afterwards 96 questionnaires were returned. After evaluating, 10 uncompleted questionnaires were put aside out of all questionnaires. Therefore, 86 completed questionnaires were examined. The survey instrument is Venkatesh (2003)'s standards and authentic questionnaire.

As mentioned earlier, in this questionnaire some variables are applied which have been used frequently by researchers in previous studies and their validity and reliability have been confirmed. But in order to localize and analyze the questionnaire in the statistical population of present study in Iran, the experts' confirmation including assessment and verification of supervisors and advisors are used. In order to have a final content assessment of questionnaires, Cronbach's alpha coefficients has been used. Voluntary moderator variable was removed due to being mandatory to use IT systems. Cronbach's alpha of the whole questionnaire is 0.81 which shows the validity and reliability of the questionnaire.

RESULTS AND DISCUSSION

In order to analyze the research data, structural equation modeling, which is a holistic approach to test hypotheses about the relationship between observed and latent variables is used. In this study, structural equation modeling helps to partial least square method and the PLS monitoring software was used to test the validity of assumptions of the model. The PLS approach is based on the variance compared to the same techniques as LISREL and Amos structural equation requires less conditions. For example, unlike LISREL modeling PLS course is more

suitable for real applications, especially when models are more complex, taking advantage of this approach is considered more appropriate.

The main advantage is that a smaller number of samples is required in this kind of LISREL modeling. In fact, the PLS has no size sample limitation and sample number can be ≤ 30 , speaking of which the result is valid. On the other hand, when there are multiple items at a time the number of samples and the measurement is low and variable distribution is uncertain PLS is considered as a powerful model. As it's been proposed, PLS modeling is conducted in two stages. In the first stage, measuring model analysis are discussed based on the validity and reliability analysis and confirmatory factor analysis; in the second stage, the structural model estimated by determining the course between variables and model parameters is studied. In here, the propriety indicators of the PLS application for the above significant model is presented.

First stage; analysis of measuring model (external model): In order to achieve convergent validity and correlation coefficient, multiple reliability tests and adapted variance were analyzed. The reliability was above 0.8 along with minimum variance of 0.5 are the two conditions for a structures validity and correlation coefficient (Table 1).

Fornel Larcker criterion: Larcker mentions that, the second root of the variance quantity explained by the (AVE) of each structure should be greater than the correlation of that structure with other structures. The correlation quantities are between hidden variables with current dimensions in the latent variable correlations section of the model in smart plus application software and it is significant because its main diagonal matrix equals 1. Then the existed quantities on the main matrix are replaced by Variance quantity Explained by the (AVE) mentioned above.

As it was mentioned the existed quantities on the main diagonal matrix should be greater than all the quantities of the column. In Table 2, Fornell and

Table 1: Structural reliability Coefficient factors (CR), Average (AVE) and Cronbach's alpha

Factors	CR	AVE
Performance expectancy	0.746	0.605
Effort expectancy	0.866	0.622
Social influence	0.724	0.724
Facilitating conditions	1.000	1.000
Behavioral intention	0.786	0.786
Use behavior	1.000	1.000

Table 2: Fornell larcker table

Fornell larcker	Performance expectancy					
	1	2	3	4	5	6
Performance expectancy	0.77	0	0	0	0	0
Effort expectancy	0.429	0.78	0	0	0	0
Social influence	0.256	0.289	0.85	0	0	0
Facilitating conditions	0.329	0.176	0.228	1	0	0
Behavioral intention	0.128	0.329	0.129	0.429	0.88	0
Use behavior	0.131	0.109	0.280	0.136	0.126	1

Table 3: Coefficient correlation and R2

Parameter	Coefficient correlation value	R ² value
Factors	0.15 < f ² < 0.35	0.19 < R ² < 0.67
Behavioral intention	0.206	0.171
Use behavior	0.063	0.060

Table 4: Result of testing hypotheses with partial least square method without modifiers

Hypothesis No	Research hypotheses	Course coefficient<0.1	t<1.96	Result
H ₁	Behavior intention-Performance expectancy	0.026	0.235	Rejected
H ₂	Behavior intention-Effort expectancy	0.397	4.241	Accepted
H ₃	Behavior intention-Social influence	0.265	2.237	Accepted
H ₄	Behavior intention-Facilitating conditions	0.234	3.519	Accepted
H ₅	Use behavior-Behavior intention	0.227	2.026	Accepted

Table5: Summary of research findings

Hypothesis No	Research hypotheses	Type of relation	Test result
H ₁	Behavior intention-Performance expectancy	No relationship	Rejected
H ₂	Behavior intention-Effort expectancy	Meaningful	Accepted
H ₃	Behavior intention-Social influence	Meaningful	Accepted
H ₄	Behavior intention-Facilitating conditions	Meaningful	Accepted
H ₅	Male>Female use behavior-Performance expectancy	Meaningful	Accepted
H ₆	Male<Female use behavior-Effort expectancy	Meaningful	Accepted
H ₇	Male<Female behavior intention-Social influence	Meaningful	Accepted
H ₈	Use behavior-Behavior intention	Meaningful	Accepted

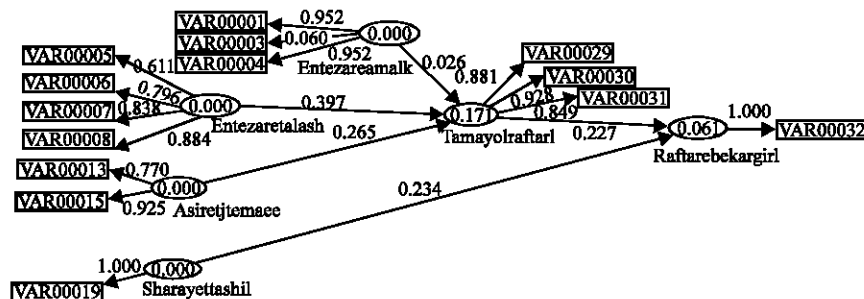


Fig. 2: PLS output with standard coefficient without modifiers

Boolestein (1982) Larcker Table, presented above, the AVE square root of the hidden variable of this study in the main matrix diameter cells is greater than the correlation between them in the lower cells. Therefore, it can be stated that in this study structures (hidden variables) of the model have more harmony with its indicators comparing with other structures, in other words it has an appropriate divergence and validity.

Second stage; analysis of structural model (internal model): Using internal model, we can study the hypotheses. Comparing the quantity of t calculated for

coefficient of each course, we can study the confirmation or rejection of each hypothesis of the research. Based on this, if t is >1.96, its significant in 99% and if t is >2.58 coefficient of the course is significant at 99% (Momeni, 2012). The result of the conceptual model test of the study shows its significant correlations in Fig. 2. The calculated numbers shown on the arrows indicate the quantity of Table 3-5.

Following here, we have the result of the analysis of research course related to male and female regarding their age and experience (Fig. 3-8).

The result of gender course analysis in females (the upper numbers indicate the course coefficients and lower numbers are significant coefficients).

Based on courses related to both male and female groups shown in figures above, hypotheses 5, 6 and 7 are approved, therefore relation between performance expectancy with technology adoption intention is

stronger in males comparing to females. Effort expectancy and social influence with technology adoption intention is stronger in females comparing to males.

Results of testing hypotheses: Table 4 shows the result of testing hypotheses in course coefficient with correlation coefficient (Fig 9).

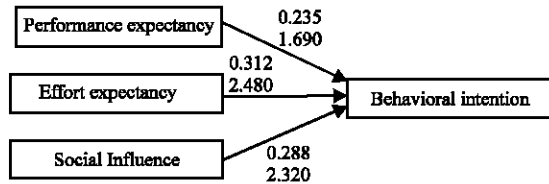


Fig. 3: The result of gender course in

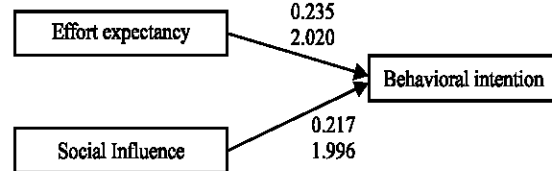


Fig. 6: The result of age course analysis in males

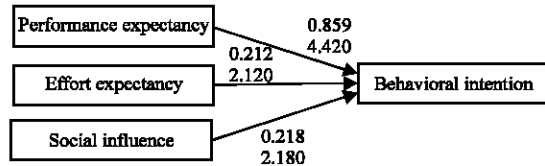


Fig. 4: The result of gender course analysis in males

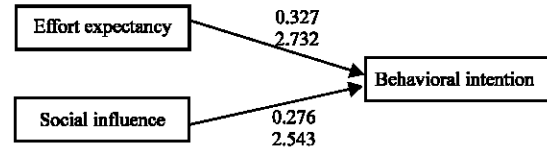


Fig. 7: The result of experience course analysis in females

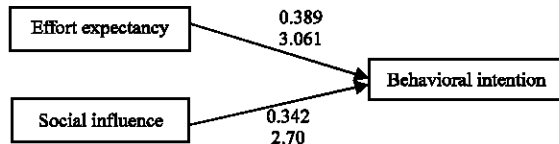


Fig. 5: The result of age course analysis in females

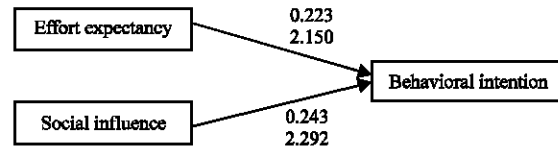


Fig. 8: The result of experience course analysis in males

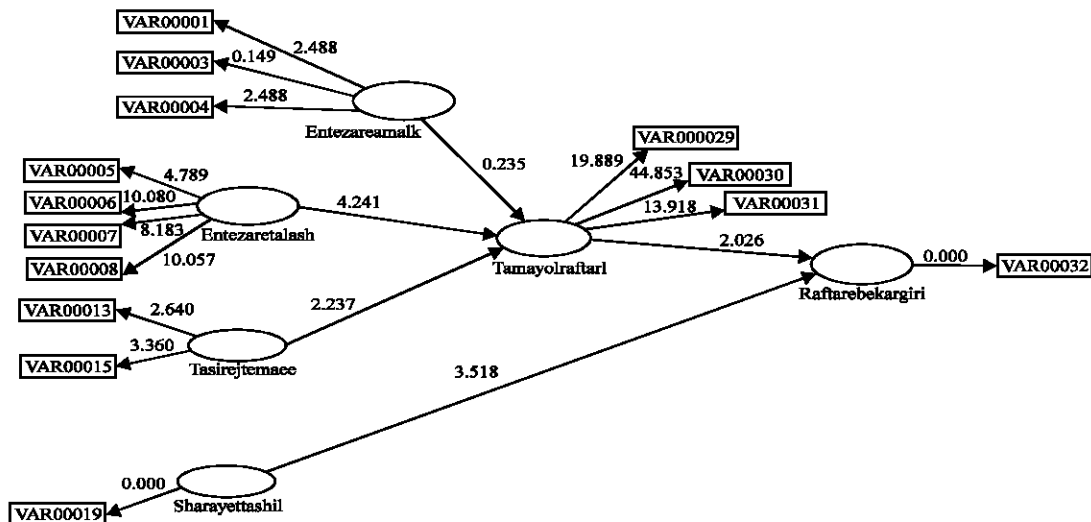


Fig. 9: PLS output with correlation coefficient without modifiers

CONCLUSION

The research findings signify that the relationship between the expected efforts, social impact with the intention of using under scrutiny technologies in cement industry is meaningful. Besides, the structure of facilitating conditions is meaningful along with application behavior in actual using of applied systems in the industry. Therefore, in order to provide greater context of adoption of information technology systems in the cement industry by potential and actual users of systems, the organizations should pay sufficient attention to the factors that facilitate behavioral intention and conditions. The structure of facilitating condition (user support) after research model assessment via questionnaire and in result of data analysis through course analysis techniques with having the highest factor load is the most important factor in the adoption and usage of information technology in the understudy industry is evaluated. The significant relationship of performance expectancy variable with the behavioral intention also was not confirmed to be evaluated. Furthermore, the results of data analysis showed that the relationship between the expected performance with the intention of using stronger for men than women. Expected effort and social impact with the intention of using technology is stronger for women rather than men. So, women have more intention to use IT systems which their application and the how it is used is easier and will encourage friends and colleagues to use the systems.

According to the purpose of this study which was the measure of understanding the systems acceptance as a successful means from IT adoption perspective and the influential factors on them through using a combination theory of acceptance and Venkatesh *et al.* (2003) (UTAUT) technology application and its actual application in Iranian organizations, including the cement industry; it can be said that expected effort variables, social effect, behavioral intention, facilitating conditions have been among the affecting factors on acceptance and technology application and other variables (performance expectancy) are rating lower. Hence, in general it can be concluded that unified theory of acceptance and application of UTAUT technology under study in Iranian organizations are also in compliance.

SUGGESTIONS

Practical suggestions: Achieving the set of effective factors which have important role in IT adoption in Iranian government and private industries is considered the first step in this research field. Therefore, the discovered

factors in this study should be authenticating to the level of the same and different industries in a practical way. In this way, besides discovering the hidden variables we can classify the discovered factors. Measuring these factors in industrial organizations and presenting executive point of views about their current condition can provide the necessary knowledge for optimized attribution of resources in order to make decisions and also periodical measurement of these factors can help improve managers operations in achieving better condition for facilitating IT adoption.

Considering the determinant role of the behavior intention variable on use behavior and IT adoption in organizations, we should pay more attention to variable of performance expectancy considering the limitations of the study. In order to control an effective factor in a specific industry, it is suggested to do some researches in other industries or social services corporations with different characteristics. Because, by using different measuring tools we can achieve more coherent and reliable results.

Theoretically, UTAUT is an improved theory on how determinants of behavior intention would lead to some results through time. Therefore, we suggest in further studies, repeat this research in specific alternative periods of time before and after treatment and study the effective result on behavior intention and other factors like discussion about training for actual system application in industrial section and other social service co operations.

We suggest repeating the pretest of this study in order to find out the stability and instability of the findings. It is recommended before research, do the necessary co ordinations with small and intermediate co operation including industrial and others because it seems for the novelty of the subject of this study, most of the managers of private cooperation are not familiar with the subject and it causes much unaware opposition in the course of research.

Regarding the adjusting key role of voluntarily using obligatory or optionally the systems as it's been mentioned in research theory, we recommend to consider the adjusting role of variables especially in UTAUT acceptance in industrial and social services sections in further researches.

It's recommended industrial and services organizations to investigate the relationship between user acceptance and personal or organizational adoption outputs and pay more attention to short time and long time effects of applying IT on outputs related to profession as efficiency, job satisfaction, organizational guarantee and other structural performances.

We suggest industrial and services organizations and also industrial software designer companies enter the

variables like coordinating technology, the obligation and constructions of personal ability as ability of intelligence cognition in adopting IT along with using unified model.

LIMITATIONS

This study had some limitations; here we refer to some of them. Scansion of organizations and active workers unwillingness in collaboration and completing the questionnaires distributed among them. We can consider the superficial time period selection as one of the limitations of this research because using continues researches in different periods of time helps evaluating variables and achieving better relationship, in this way we can get more reliable results.

The participants of this research were managers and specialists and this was because it was not possible to find users with electronic knowledge in the organization. Anyway, choosing managers and specialists as our participants could limit the generalization of the result.

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