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A Model for Implementation and Development of Electronic Banking in Iran (Case Study: Bank Resalat)

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Abstract
To achieve success, banks need to adopt and develop new banking technologies, and success is achieved when the new technologies are accepted and continuously used by customers. Therefore, in addition to the technical development of new banking technologies, factors contributing to acceptance of these technologies by customers shall be taken into account. This paper presented a review of previous research and expert opinions, and simultaneously identified different factors influencing the acceptance and diffusion of electronic-banking (e-banking) in Iran. Afterwards, through an exploratory factor analysis, these factors were classified into the following three categories: perceived factors, technology characteristics, and external factors. Then, using the structural equations modeling (SEM) technique, the model of acceptance and diffusion of e-banking in Iran was developed. Research results indicated that there was a profound relationship between acceptance and diffusion of the technology (e-banking).

Keywords: technology acceptance model, innovations diffusion model, electronic banking, structural equations modeling

Introduction

All organizations, especially banks, need to employ new banking systems and align with global changes to survive and satisfy the needs of their customers. A precise understanding of factors affecting acceptance of technology by users can considerably contribute to the successful implementation of new technologies. For successful acceptance, constant adoption, and diffusion of a technology, the conditions and behaviors of users and factors influencing them shall be identified to be able to develop precise plans based on identification results. However, acceptance of technology is always accompanied by challenges and obstacles. Therefore, organizations should analyze all of the aspects of introduction of a technology into their organization before transferring or developing that technology. This analysis can take place with a technology acceptance model, which examines the case thoroughly and inclusively. Hence, numerous studies have been carried out to investigate the factors influencing acceptance of technology, and most of these studies have adopted one technology acceptance model. Among the technology acceptance models, the Technology Acceptance Model (TAM) developed by Davis in 1989 has attracted more interest, and numerous studies have been carried out based on this model. Davis introduced perceived usefulness and perceived ease of use as two of the most important factors influencing acceptance of technology (Davis, 1989). In his Ph.D. thesis, Totolo (2007) examined the acceptance of computer technology by high school principals and concluded that time limits, fear, lack of training skills, and lack of computer exercise were the obstacles to acceptance of technology. Unlike other researchers, who added new variables to the TAM model, Hernandez et al. (2008) carried out a study, in which he analyzed the adoption of financial and business management software in a new competitive

environment. He reported that a simple technology acceptance model can be properly effective. Using the Technology Acceptance Model, Pan and Jordan-Marsh (2010) studied different factors influencing decisions of old Chinese people regarding acceptance of the Internet and found that perceived ease of use and subjective norm considerably influence IT (information technology) acceptance. They also reported that with an increase in age, ease of use becomes more important. In general, numerous factors contribute to the acceptance and diffusion of new banking technologies (e-banking), and various studies have been carried out on this topic. Each of these studies has identified and examined a number of factors influencing acceptance of technology with regard to the environment under study. Mukherjee (2007) stated that customers' knowledge of internet banking should be considered a factor influencing the acceptance of new technologies. In their research,Zhou et al. (2010)proposed a mobile banking acceptance model, and found that one of the factors influencing acceptance of mobile banking was satisfactory expected system performance. Moeinzadeh et al. (2012) examined the innovations diffusion theory in mobile banking and indicated that if trust is not based on knowledge mobile banking will be accepted very slowly.

Most of the studies on the technology acceptance model has investigated acceptance of technology from a specific point of view, and thus these studies almost lack a systematic simultaneous approach to the acceptance and diffusion of technology. Accordingly, it is necessary to have a new look at the acceptance and diffusion of technology and study its different components and aspects. Application of the innovations acceptance model and the theory of diffusion of innovation to e-banking acceptance and promotion can open a new window to this realm, which can lead to simultaneous examination of the subjective and perceived aspects as well as the external aspects and factors of technology (e-banking) diffusion and generalization. Hence, the present paper was an attempt to identify and classify the factors influencing e-banking acceptance and diffusion with an exploratory approach based on a review of previous research. Afterwards, using structural equations modeling (SEM) technique and opinions of 230 IT, banking, and innovation experts, the e-banking acceptance and diffusion model was developed.

Research Theoretical Fundamentals

Technology Acceptance Models

Many models were proposed to identify and measure the effect of factors influencing technology acceptance, and most of these models were developed in the United States. Some of these models include the following: the Technology Acceptance Model version 1 (TAM1) by Davis, 1989; Innovations Diffusion Theory (IDT) [4] by Rogers, 1995; Theory of Reasoned Action (TRA) by Fishbein & Ajzen, 1975; and Technology Acceptance Model 2 (TAM2) by Venkatesh and Davis, 2000.

Theory Acceptance Model

In 1989, Davis proposed the Technology Acceptance Model (TAM) based on TRA (Theory of Reasoned Action).

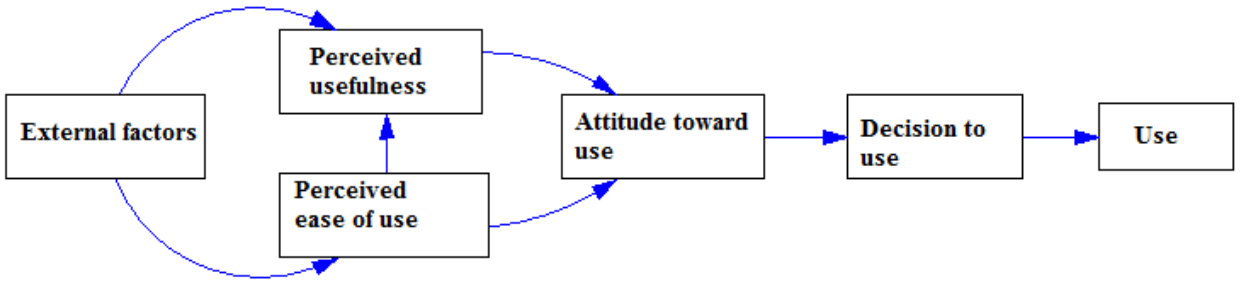

Figure 1: Technology Acceptance Model version 1 (Davis, 1989)

He studied 152 computer application users and indicated that perceived usefulness and perceived ease of use influence use of technology. As seen in Figure (2), perceived ease of use and perceived usefulness are two of the main pillars of TAM.

The TAM model has been tested in many investigations, and it has been indicated that the ability of this model to interpret attitudes toward use of information systems is higher than other models. Moreover, the relationships between the constructs of these systems have been approved in many studies (Davis et al., 1989; Hernandez et al., 2008; Hussein and Silva, 2009; Yiua et al., 2007).

Innovations Diffusion Theory

The Innovations Diffusion Theory (IDT) was introduced by Everett Rogers, the well-known researcher in the field of communications. This theory examines the diffusion of the innovations social process including new ideas and methods for using devices, ways of accessing them, and methods of spreading those ideas and methods in a social system. This theorist defined innovation as an idea, action, goal, means, or act of adapting to a variable condition, which is assumed to be new by the person.

The process of diffusion of innovations consists of 4 steps (Rogers, 1995):

1. Knowledge: This is the step of facing innovation and understanding its function. Knowledge of a new phenomenon is obtained when the person or decision-making unit is faced with innovation and its function.

2. Persuasion: In this step, a positive or negative attitude to the new phenomenon is formed in the person's mind.

3. Decision: In this step, the person does assessments in his/her mind and makes the final decision on accepting or rejecting the innovation. Any related formal decision that is not based on the two previous steps acts as an obstacle.

4. Confirmation: In this step, after making the decision, the person searches for information that approve of his/her decision or, in other words, boost the decision. Any negative information on the decision can stop the process of innovation adoption.

Rogers defines adopters of innovations into the following categories based on the degree to which they accept innovation.

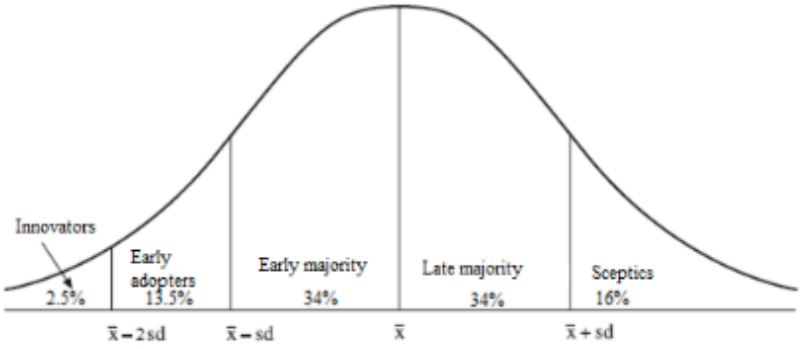

Figure 2: Classification of adopters based on innovation (Rogers, 1995)

In addition, Rogers enumerates the following characteristics for innovation (Rogers, 1995):

- Relative advantages
- Compatibility
- Complexity (simplicity)
- Observability
- Trialability

In general, examination of these models reveals that all of them follow the following conceptual structure.

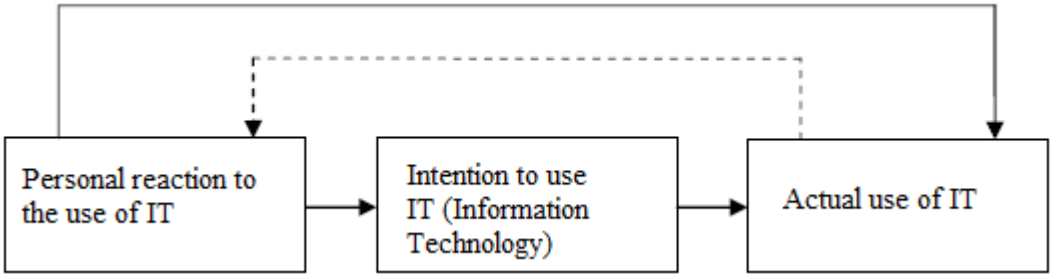

Figure 3: Conceptual model of IT personal acceptance models (Venkatesh et al., 2003)

As mentioned, the technology acceptance model (TAM) is the model that is most commonly used in studies for identification of factors influencing technology. The relationship between its constructs along with its ability to interpret behavior have been stressed several times. Hence, this model was used as the basis for the model proposed in this research.

Factors Influencing Acceptance of E-Banking

Different factors influence the acceptance of new banking technologies (electronic banking), and numerous studies have been carried out in this regard. Each of these studies has identified and examined a number of factors influencing the acceptance of technology in relation to the environment in question.

Some researchers studied the obstacles to the acceptance of IT and concluded that the lack of security and protection of privacy in the Internet were among the common and well-known obstacles to the acceptance of electronic commerce in the field of IT. Suh and Han (2002) adopted the technology acceptance model in their research and indicated that customers' trust in different e-banking instruments were among the most important factors influencing acceptance of e-banking. As stated by Pikkarainen, the customers' knowledge of the new technology should be known as a factor influencing acceptance of that technology (Pikkarainen et al., 2004). Lai and Li (2005) studied 241 graduates of business in Hong Kong using TAM to examine the variability of technology acceptance based on age, gender, and IT skills. A study on 300 users of the Internet, as a distribution channel for financial services in England, revealed that perceived usefulness and ease of use result in a positive attitude toward the use of technology (McKechnie et al., 2006). Yiua et al. (2007) examined the factors influencing acceptance of technology in Hong Kong banks. Their findings not only confirmed the relationship of the model's constructs on acceptance of IT, but also formed the basis of suggestions on development of strategies based on adoption of the Internet in provision of bank services. Barouti Ardestani (2006) identified factors influencing acceptance of IT by the banking system personnel and proposed a model. Her findings indicated that unlike the results obtained in other developing countries, in which the joy of perception was an insignificant factor, this factor is one of the factors influencing acceptance of technology in Iran. Yaqubi and Shakeri (2008) compared the theory of reasoned action, the theory of planned behavior, and the technology acceptance model with an emphasis on acceptance of internet banking. They found that in terms of all of the three criteria, the theory of planned behavior performed better than the other two models. Baqeri et al. (2009) studied development of TAM for Internet banking. Findings of their research confirmed the ability of the developed TAM model for adoption of internet banking. GerhardtSchierz (2010) conducted a study in Germany to investigate the solutions for increasing the use of cell phones for electronic payment purposes within the framework of TAM.

Methodology

This study was primarily aimed at identifying factors influencing the acceptance and diffusion of electronic banking in Iran. The primary question of this research was "What are the factors influencing the acceptance and diffusion of e-banking?" The qualitative data for this research was collected through a semi-structured interview. The sample size was determined in the qualitative section using the saturation sampling and intentional purposive sampling methods considering the significance of data adequacy. To confirm the model, a researcher-made questionnaire was designed and completed by banking experts and bank informatics experts. The questionnaires were analyzed using the structural equations modeling (SEM) technique and LISREL.

Model Design and Development

In this section, first the relationships required for expressing the research theoretical framework is described. This section studies the general technology diffusion and acceptance indices required to build the model. This part of the research involves applied research using the descriptive research method.

Research Theoretical Model

Table 1: Research extracted variables

Row	Factor	Source
1	Perceived ease of use	Technology acceptance model (TAM) (Davis, 1989)
2	Perceived usefulness	
3	Attitude toward perceived use	
4	Tendency for perceived use	
5	Knowledge	Diffusion of Information Model (DIM) (Rogers, 1995)
6	Confirmation	
7	Relative advantage	Innovation characteristics (Rogers, 1995)
8	Compatibility	
9	Complexity (simplicity)	
10	Observability	
11	Trialability	
12	Habit	Shahabi, 2010; Park et al., 2009; Hamilton, 2006; Ivana, 2008; Limaym et al., 2001
13	Trust	Cho, 2007; Li & Lain, 2005; Kramer, 1999; Suh and Han, 2002
14	Output quality	Venkatesh and Davis, 2000; Jong Ae, 2005; Vathanofs et al., 2008; Salavati, 2004; Barouti Ardestani, 2006
15	Advertisement	Shahabi, 2010 (Experts)
16	System security	Schierz et al., 2010; Mukherjee and Nath, 2003, 2007; Maenpaa, 2006; Vijayasarathy, 2004; Pikkarainen et al., 2004; Howcroft et al., 2002
17	Technical support	Schierz et al, 2010; Polancic et al., 2010; Barouti Ardestani, 2006
18	Training	Hamner & Kaiser, 2009; Totolo, 2007; Pikkarainen et al., 2004; Anadrajan et al., 2002
19	Policies and rules	Qazinour, 2004 (Experts)
20	Infrastructure	Experts

To the design the model for showing the logical relationship between acceptance and diffusion of technology, the TAM (Technology Acceptance Model) and DIM (Diffusion of Innovation Model) models were used as the bases. Moreover, the characteristics of innovation and other factors were added to the variables. Table (1) presents the extracted factors.

Exploratory Factor Analysis

Bartlett's Test and Classification of Factors into Three Groups

The results of the exploratory factor analysis in SPSS19 were as follows.

Table 2: KMO index and Bartlett's test

Bartlett's test	KMO index
0.000	0.78

As seen, the model demonstrates a very satisfactory validity with respect to the KMO index and Bartlett's test. The data adequacy index or KMO determines whether the existing amount of data is adequate for a factor analysis. The value of this index (which is higher than 0.7) reflects the positivity of this data characteristic. Moreover, feasibility of the factor analysis depends on significance of the Bartlett's test result. The next output consists of three parts. These components include the eigenvalues and determinants of factors that remained in the analysis. The extracted factors are either rotational or non-rotational. According to the following table, three factors were selected as the primary factors with eigenvalues of higher than 1. These three factors explain about 61.04% of the variations.

Table 3: Components rotated matrix

Row	Factors	Components		
		1	2	23
1	Knowledge	0.795		
2	Perceived usefulness	0.653		
3	Perceived ease of use	0.497		
4	Attitude toward use	0.446		
5	Tendency for use	0.837		
6	Habit	0.668		
7	Trust	0.479		
8	Confirm	0.754		
9	Compatibility		0.462	
10	Complexity		0.713	
11	Observability		0.818	
12	Trainability		0.770	
13	System security		0.592	
14	Output quality		0.705	
15	Relative advantage		0.551	
16	Required infrastructure			0.412
17	Training			0.763
18	Advertisement			0.532
19	Policies and rules			0.734
20	Technical support			0.703

As seen, acceptance factors are classified into three groups. In accordance with the theoretical fundamentals of this research, the groups were labeled as follows: 1) perceived factors (8 indices); 2) technology characteristics (7 indices); 3) external factors (5 indices).
Moreover, the following three-dimensional model shows the scattering of factors in relation to the main extracted factors.

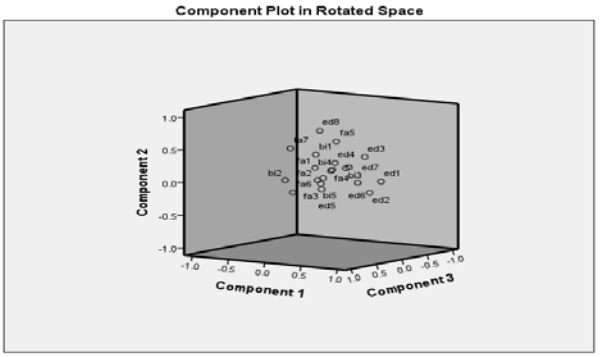

Figure 4: Three-dimensional model of the components rotated matrix

Model Development

Based on the expert opinions on the resulting indices, it is necessary to carry out a general classification of the variables.

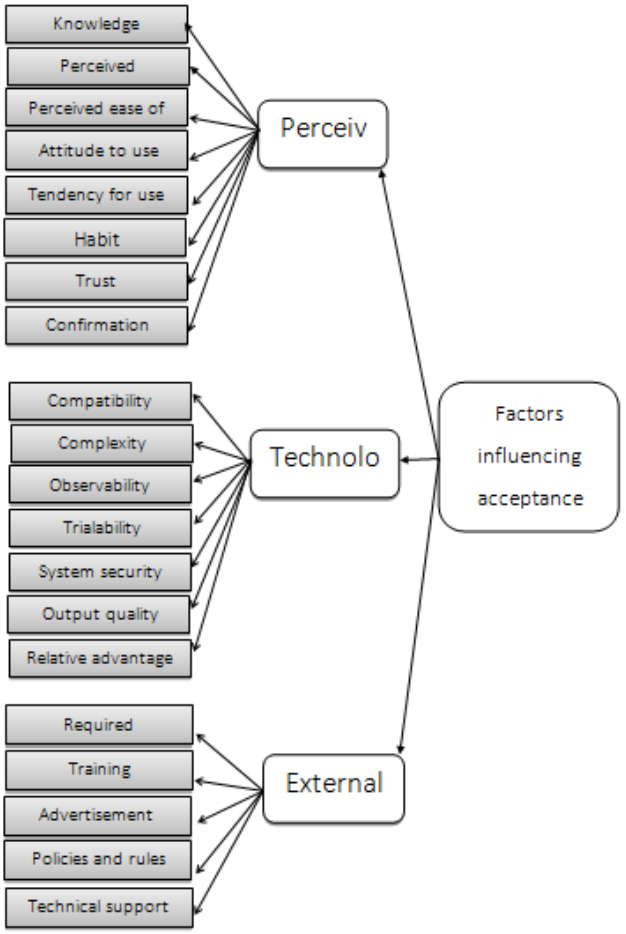

Figure 5: Development of the conceptual model – adding measurable indices

To this end, the following model shows an overall schematic of the relationships between latent and observable variables in the structural model.

Second Part of the Test on the Study Population

Structural equations modeling (SEM) can be used to confirm a prediction model, to test alternative models, or to generate a model. This statistical method is also used to develop a model in computer applications (Schudrich W., Auerbach C., Liu J., Fernandes G., McGowan B., and Claiborne N., 2010). In this research, this model was used to examine the relationships among the indices of the developed model. In the next step, the model was tested on the statistical population to obtain the effect of variables on the statistical population, which included 230 bank experts from emerging and successful banks in the field of e-banking. This section was carried out using the descriptive-correlational method.

The qualitative data was quantified as follows based on the Likert scale.

Table 4: The scale for quantifying the qualitative data

	Very poor	Poor	Moderate	Strong	Very strong
Corresponding numbers	1	2	3	4	5

Therefore, the research model is developed as follows based on the structural equations model.

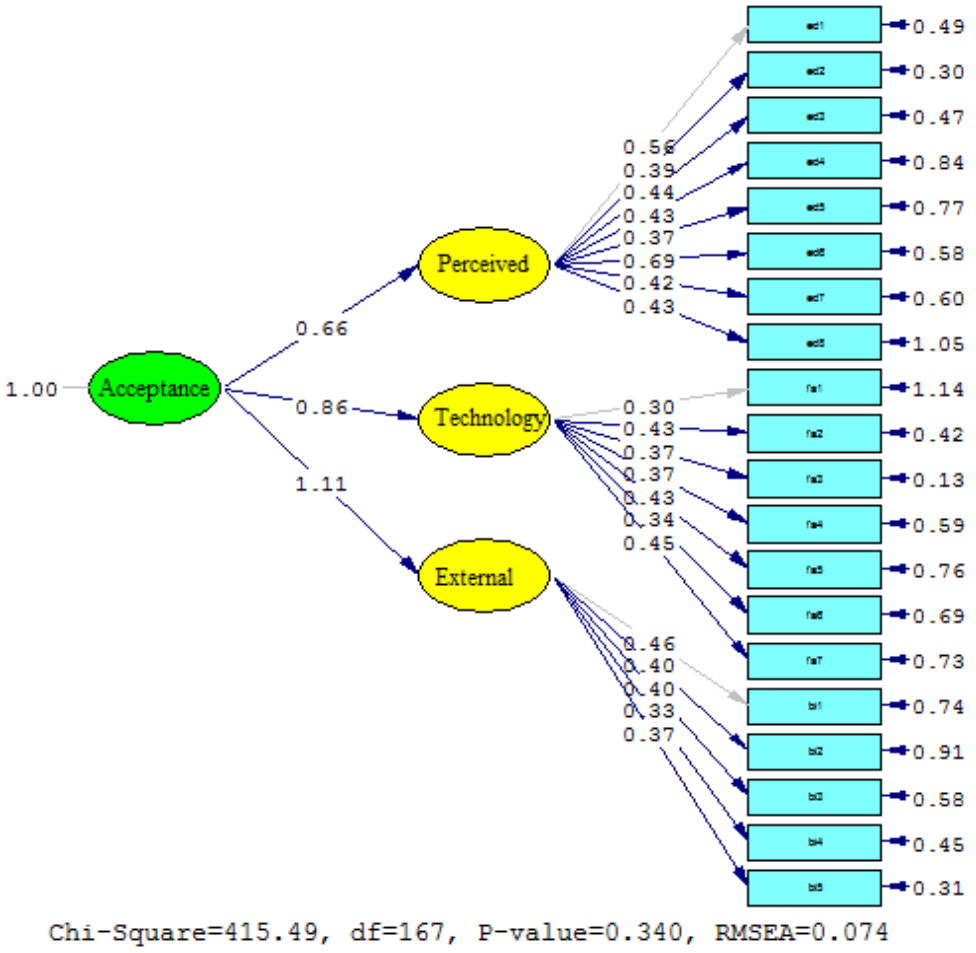

Figure 6: Non-standard estimation

The above figure shows the results of non-standard estimation of SEM.

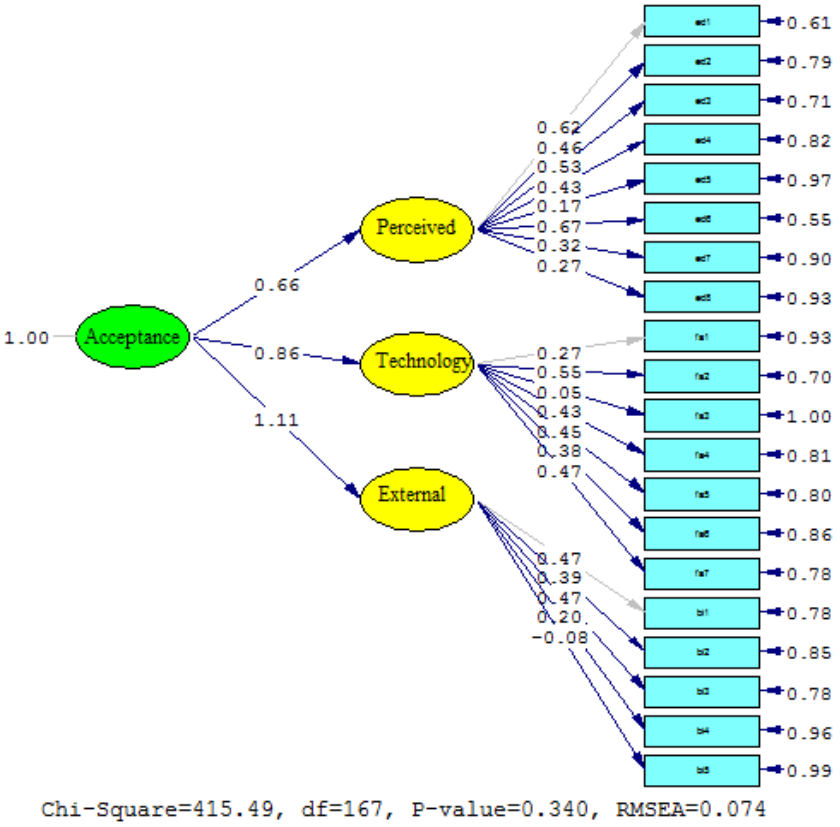

Figure 7: Standardized estimation

The above figure presents the standardized estimation of SEM.

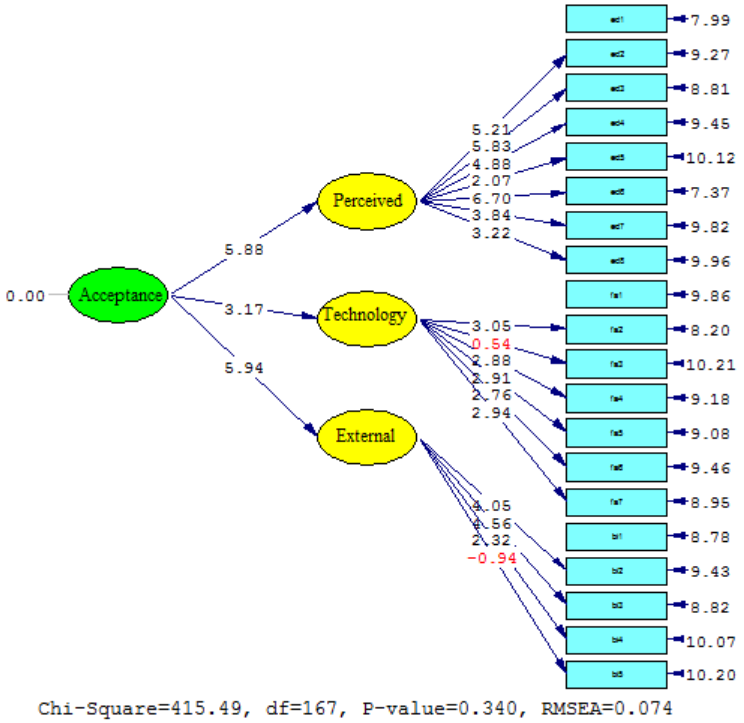

Figure 8: P-values

Analysis of Model Relationships

- As seen, of the perceived latent indices, the habit of using e-banking and knowledge of e-banking are the most effective indices, which shall be valued more. The resulting standard coefficient, which is equal to 9.67 and 0.62,shows the degree of the relationship.
- Concerning the main relationship in this model (i.e. the effect of perceived factors, technology characteristics, and external factors on acceptance and diffusion of technology) external factors had the highest effect on technology acceptance and diffusion. Among the external factors, the existing infrastructure and advertisement had the highest effects.
- Concerning the p-value, indices with values lower than 1.64 at the error level of 0.05 should be ruled out from the model and should be marked in red. Considering the output of the structural model in Figure (9), observability (as one of the technology characteristics) and technical support (as one of the external or environmental factors) are not significant.
- The model's ratio of X2to its degree of freedom is smaller than the allowable value. In general, in SEM, the fitness of the model increases with a decrease in the chi-square value. In this research, the normalized chi-square was 2.48. Hence, the model's performance is satisfactory with respect to this index.
- The RMSEA index of this model is 0.074. In general, in SEM, the model is considered a very good model if its RMSEA is lower than 0.05. If RMSEA is between 0.05 and 0.08, the model is considered a good model. In this research, the model's RMSEA was satisfactory.
- Among the major fitness indices in this research were NFI=0.91, NNFI=0.90, CFI=0.93, and AGFI=0.90, which reflected the very good fitness of the model.

Conclusion

Improved public access to IT has altered the lifestyles and working styles of citizens. Therefore, electronic banking has been widely adopted and welcomed properly by advanced societies in the past decade. Successful implementation of e-banking involves knowledge of factors affecting the acceptance and diffusion of this technology in society. This point was revealed by the results of the SEM analysis, where it was indicated that Iranians' knowledge and habit of using different e-banking instruments were highly important for the acceptance and diffusion of e-banking. One of the solutions for attaining this goal is to provide the infrastructure required for development of e-banking and promotion/advertisement of this technology. In his research, Shahabi (2010) simulated the acceptance of e-banking in Bank Refah and found that one of the most important factors influencing the use of e-banking in Iran is people's habit of using this technology along with advertisements of this instrument. However, other mediatory factors also influence the acceptance of technology. For instance, Ahmadzadehfard Shirazi (2009) indicated that education, income level, and tendency for change, experiment and risk affected the acceptance of mobile banking.

As shown by the dynamic model of this research, there is profound relationship between acceptance and diffusion of technology (e-banking). Hence, banks not only should focus on technical and quantitative development of e-banking, but also should study factors influencing acceptance of e-banking by customers. Banks should consider the latter task one of the important aspects of technology management in their organizations to be able to achieve success and generalize the use of e-banking.

Many studies have referred to the advantages of electronic and Internet banking from the viewpoint of clients and banks. In their research, Black et al. (2002) concluded that a shorter waiting time, cost saving, and lack of spatial dependence were among the important advantages of e-banking from the viewpoint of customers. Bauer et al. (2005) introduced efficiency and cost saving as the

most important advantages of e-banking from the viewpoint of customers. The place of internet banking is highly dependent on the acceptance of technology by its users, who are considerably important (Byers &Lederer, 2001).

It is recommended to simulate the proposed dynamic model with the data from an actual environment to study the different effects of acceptance and diffusion of e-banking on societies.

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