

Research Article

FACTORS INFLUENCING THE ADOPTION OF ELECTRONIC BANKING USING ROUGH SET THEORY (CASE STUDY: MELLAT BANK)

Mohammad Ghezelayagh¹ and *Mohsen Davarpanah²

¹*Department of Statistics, College of Mathematics and Computer, Shahid Bahonar University of Kerman*

²*Department of Management, Kerman Branch, Islamic Azad University, Kerman, Iran*

**Author for Correspondence*

ABSTRACT

Banks and Financial institutions play a crucial role in the economic development of each country. Now, due to a number of banks and financial and credit institutions in the country, Also, due to the privatization process of state banks, and changing credit unions and financial institutions to bank credit, their electronic services have a particular importance. Meanwhile, the customer view provides a base for measuring processes and practices to empower individuals involved in providing services and participating in important decisions, and given the tendency to use electronic banking services because of its unique characteristics and involvement of the Bank, for the transfer of financial resources, E-banking has a role in its implementation as an integral part. Present study investigates the factors influencing the adoption of electronic banking using Rough model. The population of this study consisted of all the Mellat banks in the Kerman province. In this study, a simple random sampling technique has been used and the sample size is 190 people. The model results showed that the electronic banking, which including 1- usefulness 2- ease of use 3- Providing data for ease of use 4. Security and confidentiality 5- The quality of the internet connection on accepting banking in customers' views is moderate to high so the planning needed in this regard would be of particular importance.

Keywords: *Electronic Banking, Internet Connection and Rough Set Theory*

INTRODUCTION

In recent years due to major changes in technology and the development of communication, the banking industry has changed dramatically. Electronic communications and access of a large number of people to the worldwide web has provided suitable bed for the establishment of trade and economic exchanges. This increases competition in the banking industry and provides services of the electronic banking (Shahroodi *et al.*, 2008). Amazing development of information technology and its spread to the money and bank markets has facilitated current methods of banking in addition to facilitating bank clients' affaires. The judgment of clients in banking affaires is based on the ability of banks to help solve business problems and development of the firm. Security, transaction speed, a friendly relationship with the consumer, convenience and ease of use, reliability and privacy issues, are some of the most important factors in choosing the bank by customers (Serkan *et al.*, 2004; Silo *et al.*, 2005). So the adoption of online banking in most countries has been rising; so that the connection of electronic banking in the leading countries has been more than fifty percent (True *et al.*, 2004). In the banking system, do not waste time and doing the affairs quickly is the most important success element in the banks competition and customers as a major determinant of the competitiveness, allow great value for the speed and technology and in the next level for bank technical expertise. In modern banking, explaining bank's services, especially electronic banking services are required and hence to be efficient banks need to obtain sufficient information from the customer, to understand their interests and needs and to develop relationships with them.

Electronic banking is providing opportunities for staff to increase the speed and efficiency of banking services in the branch and also for processes between the branches and the banks around the world and providing hardware and software facilities to customers in order to use them without having to physically be at the bank, at any hour of the day to do their banking operations through the safe channels of

Research Article

communication and confidently. In other words the electronic banking is use of advanced hardware and software technologies based on telecommunications and networks to share resources and financial information in electronic form and there is no need to the physical presence of the customer at the branch (Hamidzade, 2007). Establishing the electronic banking system, in addition to the positive impact on the economic, social and other aspects will have a significant positive effect. Hence, according to the fact that electronic banking in the country is lagging behind compared to other leading countries, so the obstacles to the establishment and development of e-banking should be identified and some guidelines should be applied on its basis. This study discusses the factors affecting the adoption of electronic banking among the Bank's clients.

Research History

Klaus (2007), his study is on the factors affecting the development of electronic banking and he divided influential factors to two categories, the soft factors including social, cultural, administrative, financial, and hard factors including technical and economic factors and assessed their impact.

Kasalo *et al.*, (2007) studied the role of customer satisfaction, trust and usability of the customer on loyalty. In this study, using a correlation analysis and chi-square test, variables such as the ability to use, faithfulness and trust were studied. Siam (2006), Electronic banking services, in short term has negative impact on bank profitability and this negative effect is resulted from the bank's investment in infrastructure and training of staff but in the long run these services will have a positive effect on the profitability of banks. Sylvester (2005), investments in IT systems, increases the efficiency of banks; but efficiency improvement compared to the benefit performance is less. Krishnan *et al.*, (2004) in a study to measure the modern banking services conducted by some academics of Multimedia University in Malaysia, Communication technologies and the development of telecommunications are introduced as a main mutation in the Malaysian banking sector. The result of this change has been widespread use of modern banking services such as ground around ATM machines, telephone banking and home banking. These major changes have been made to satisfy the customers. Among the mentioned services, the most popular use has been telephone bank and the lowest has been telephone bank. According to the studies of the authors, internet banking in Malaysia has not been created, but it seems the government is seeking to create conditions for its implementation. Svyang and Les (2004) Evaluating the quality of web sites and customer satisfaction, the study was conducted on Cloth Retailers the most important variables in this study are: the appearance of the Web, the web to be fun, information proportional to needs, financial capability, response time, reliability and customer satisfaction. In a study by the National Institute of Communications in France conducted in collaboration with the Zylina Slovakia University, Factors influencing the uptake of e-banking customers have been studied. According to these studies, in the process of providing banking services, understanding of consumers' behavior and factors affecting the quality of services have been considered affective. In order to increase the quality of banking services researchers consider several factors: response time, service domain, customer relationship, financial information availability, ease of use, security, designing an appropriate graphical environment are the effective ways to attract internet customers. Asnrimansky and Hayes (2000), the study of electronic consent in its elementary investigation mentions the electronic consent as a general component in this study that reflects the collective effect of a set of discrete experiences of service providers during a certain period.

Molavi (2009), in a research on the relationship between electronic service quality and users' electronic satisfaction concluded that there is a significant relationship between electronic service quality and its dimensions (efficiency, reliability, supplying orders, privacy, response, recovery, and contact) and electronic satisfaction of users in central branch of Agricultural Bank in Tabriz. Also efficiency of electronic service has the highest communication with the electronic consent of users. Amini (2006) has conducted a study to investigate and identify obstacles and challenges in the development and improvement of e-banking in Parsian Bank. The research investigates technology, management and cost variables and examines challenges, problems, obstacles and advantages facing electronic banking. (Babazadeh, 2005), examines the barriers of electronic banking creation and development in Iran and he

Research Article

came to the conclusion that the low level of people awareness of the benefits of electronic banking, Weakness of legal structure at the entrance to the electronic environment, State structure of commercial and professional banks, poor infrastructure, electronic banking demands and inadequate supply of electronic banking are main obstacles for electronic banking in Iran.

MATERIALS AND METHODS

This is an applied research and in terms of methodology it is survey research. After research variables, tools and methods of data collection, reliability and validity, the population and the sampling and data analysis are discussed. To collected intended data, researchers use different tools. In this study, according to the purpose of the raised questions, two methods of library and field studies have been used. In the library method for data collection and research history many specialized books and articles have been used. In the field method: The questionnaire used in this study. The questionnaire is about empowerment. It should be noted that: dependent variable is the acceptance of e-banking by customers and independent variable includes 1- usefulness, 2- Ease of use, 3- Information ease of use, 4- Security and confidentiality, 5- The quality of internet connection. Each component measuring is done by a number of questions and to answer questions the Likert scale is used. The population of this study consisted of all the Mellat banks in Kerman province. In this study, the sampling method was simple random sampling method and sample size includes 190 people.

RST method was used in inferential statistics to examine the relationship between variables. Rough set theory was developed in the early 1980s by Zdzyslav Pavlak. This view is for expressing and checking for issues where there is uncertainty and ambiguity. It is a powerful instrument to eliminate and reduce data and redundancy and irrelevance data from the database. The lower and the upper approximation of a set of objects are based on the properties of the objects. To use this system, information theory, we define as a flat table. Rows in the table are about objects and elements the columns contain the conditional features and characteristics of the decision. So $IS = \langle U, AUD \rangle$ is a decision / information systems in which $D = A \cap \emptyset$ and D is mainly a single element set and $A = \{a_1, a_2, \dots, a_k\}$ is a non-null set. Element of set A are called conditional characteristics. For any non-empty set $A \subseteq B$ is an equivalence of IB on U as $U \times IB \subseteq U^2 = U$ and is defined as follows:

$$(x, y) \in IB \equiv_D \forall a \in B (a(x) = a(y)) \quad (1)$$

In which $a(x)$ shows attribute value of an in element or object x from U . It is easy to show that this relation induces equivalence on U . In fact it means that two objects X and Y of U are equivalent to B attributes, when for such attributes, the values are the same. To be more precise: the x and y values for each attribute a of B , are the same.

Equivalence class of x element to IB is defined as follows:

$$x/IB = \{x\} \cup \{y \in U \mid \forall a \in B (a(x) = a(y))\} \quad (2)$$

And the set of all equivalence classes of elements x in U is as follows:

$$U/IB = \{x/IB \mid x \in U\} \quad (3)$$

Obviously, this collection gives a partitioning of the U . In addition to the partitioning of P of U an equivalence of $E(P)$ consisting of pairs (x, y) can be defined so that the two elements x and y can be an element of the partition P .

To be more precise, if $P = \{p_1, p_2, \dots, p_k\}$ is a partition of U . Then:

$$(P_j \times P_j) \quad (4)$$

$$R = \bigcup_{j=1}^k P_j \times P_j$$

P is an induced equivalence by the P partition of U .

Equivalence classes of x / IB for $X \in U$ are called preliminary sets and equivalence classes x / ID of $x \in U$ are called Concept Sets.

Research Article

The overall process consists of:

$$\begin{aligned}
 X_1 &= \{x \in U \mid d(x) = d_1\} \\
 X_2 &= \{x \in U \mid d(x) = d_2\} \\
 X_3 &= \{x \in U \mid d(x) = d_3\}, \dots \\
 X_r &= \{x \in U \mid d(x) = d_r\}
 \end{aligned}
 \tag{5}$$

Where $V_d = \{d_1, d_2, \dots, d_r\}$ is the set of values for all objects U . Discernibility Matrix and reduction sets of RED are defined as usual in the theory of Rough. Suppose: $B = Red$, from RED set, we calculate the following sets:

$$\begin{aligned}
 &IB(X_1), IB(X_1) \\
 &IB(X_2), IB(X_2), \dots IB(X_r), IB(X_r)
 \end{aligned}
 \tag{6}$$

So some strong decisions and some of the probable rules are obtained by ROSE2 software and the necessary conclusion is obtained. Reliability is one of the technical characteristics of measuring instruments. The mentioned concept deals with the fact that to what extent measuring instrument provides the same conclusion in the same conditions. Cronbach's alpha was used to determine the reliability of the questionnaire. The validity or reliability of the questionnaire was calculated as 0.88. Validity of this instrument was confirmed by experts and is valid.

Data Analysis

According to survey data collected from 190 questionnaires, classifying information is as follows:

Table 1: Variables Valuation

Verbal values	Category	Classification Range	Number of questions	Variable	Row
Low	1	1-5	3	usefulness	1
Medium	2	6-10			
High	3	11-15			
Low	1	1-3	2	Ease of use	2
Medium	2	4-6			
High	3	7-10			
Low	1	5-12	4	Presenting the information	3
Medium	2	13-20			
High	3	21-25			
Low	1	1-3		Security and confidentiality	4
Medium	2	4-6	2		
High	3	7-10			
Low	1	1-3		The quality of Internet communication	5
Medium	2	4-6	2		
High	3	7-10			

Adoption of electronic banking variable has Classification Range of the number of questions 11 and its Range in three categories is 5 to 15, 16 to 25, 26 to 40 and 41 to 55.

The decision variables in the model variables, conditional acceptance of electronic banking and electronic banking are also components including: 1- Usefulness, 2- Ease of use, 3- Presenting the information, 4- Security and confidentiality, 5- The quality of Internet communication. Table 2 shows the results obtained from the rough.

Research Article

Table 2: Data from the output

Usefulness (A1)	Ease of use (A2)	Presenting the information (A3)	Security and confidentiality (A4)	The quality of Internet communication (A5)	Adoption of electronic banking (D)	F
1	1	1	1	1	1	2
1	1	1	1	1	2	3
1	1	1	1	1	2	2
1	1	1	1	1	1	4
1	1	1	1	1	1	2
2	1	1	1	2	1	2
2	1	2	2	2	1	4
2	1	2	2	2	2	2
2	1	2	2	2	2	2
2	2	2	2	1	2	3
1	2	2	1	1	1	6
1	2	2	1	1	1	39
2	2	2	1	1	2	21
2	2	2	1	2	2	8
2	2	3	2	2	2	6
2	2	3	2	3	3	5
3	2	3	2	3	3	13
3	2	3	3	2	3	12
3	3	3	2	3	3	8
3	3	3	3	3	3	19
3	3	3	3	3	3	17
		total				19
						0

The first law states that if electronic banking ease of use in bank to bank customers is low and presenting the information is evaluated moderate, as a result the adoption of electronic banking will be also moderate in customers' view. The second law indicates that if the bank's usefulness of e-banking is high in customers' view and ease of use is low then adoption of electronic banking is moderate. The third law proves that if the usefulness and quality of Internet communication is considered high, then the acceptance of e-banking will be high. The fourth law states that if presenting the information is moderate and security and confidentiality is moderate then adoption of electronic banking will be moderate. The fifth law indicates that if the ease of use is low in the bank and the quality of Internet communication is also moderate, adoption of electronic banking by customers will be moderate downward. The sixth rule is that if the usefulness is evaluated high by customers and the quality of Internet connection is moderate. Adoption of electronic banking will be moderate to high. According to the results managers can better decide about how to promote electronic banking and achieve the desired results faster.

Conclusions and Recommendations

In order to identify factors influencing electronic banking, many scholars have done some research with a statistical approach in order to help managers to make better decisions. Approach of researches has been upon the components of electronic banking, these components are related to the adoption of electronic banking in customers' view and in this study, the adoption of electronic banking is positive in bank customers' view and it is moderate to high. By increasing the efficiency of electronic systems and ease of use of these systems, consumers easily accept bank electronics and technology. Each electronic payment system should be able to have the best performance in every step of the service process. To achieve a high level of usefulness, factors such as the granting special discounts to customers for purchasing by Mellat

Research Article

bank cards, free internet access at specified times to check account status ... are very important. Ease of use is the degree to which the user expects to achieve its goal with fewest attempts. By speeding up speed of customer service and timely and appropriate response, customer satisfaction can be achieved. So in using technology and modern technologies in provide services banks believe that increasing customer satisfaction requires providing electronic services with high quality. Security and confidentiality is also an important factor in the adoption of electronic banking by the bank's clients that the higher security of electronic banking system, consumer confidence will be higher and they accept electronic banking more easily. Also, if the Bank is to provide information and knowledge in the field of e-banking for customers in this field, adoption of electronic banking will increase in customers' view. The higher quality of internet connection and to perform the service required by bank customers without the need for additional efforts, electronic acceptance would be higher in customers view.

Suggestions

1. Extending culture of using internet banking services to inform and encourage customers to use this service.
2. Eliminating problems and issues related to infrastructure of electronic banking services to accelerate providing services smoothly.
3. The use of experts and efficient people in service support and other parts of electronic service to resolve any problems in case of occurrence.
4. Mellat Bank would encourage the use of this service by providing superior and special service including shopping festivals for Cash card holders.
5. Designing webs that include features of ease of use and more operational power.

ACKNOWLEDGEMENT

We are grateful to Islamic Azad University, Kerman branch authorities, for their useful collaboration.

REFERENCES

- Amini A (2006).** Studying obstacles and challenges in improving the electronic banking in Parseian bank. Dissertation for Master Shahid Beheshti University in Tehran.
- Babazadeh M (2005).** Studying barriers of creation and development of e-banking in Iran chief economist Dissertation for Master, Tehran Azad University, Science and Research unit.
- Beaubouef T and Lang R (1998).** Rough Set Techniques for Uncertainty Management in Automated Story Generation. *Proceeding of the 36th Annual Conference on Southeast Regional Conference, April* 326-331.
- Klaus Hubacek Dab G and Anamika B (2007).** Changing lifestyles and consumption patterns in developing countries: A Scenario Analysis for china and India. Sustainability research institute 45-62.
- Luis C, Carlos F and Miguel G (2007).** The role of perceived usability, reputation, satisfaction and customer familiarity on the website loyalty formation process. *Computer in Human Behavior* **5**(4) 29-39.
- Molavi Z (2009).** Studying the relationship between electronic service qualities with the consent of users in the Central Branch of Agricultural Bank in Tabriz. MS Thesis, University Branch of Bonab.
- Sahut JM and Kucerova Z (2003).** Enhance Banking Service Quality with Quality Function Deployment Approach. *Journal of Academy of Business and Economics* **13**(4) 224-235.
- Siam AZ (2006).** Role of the electronic Banking Services on the profits of Jordanian Banks. *American Journal of Applied Sciences* **3**(9) 52-68.
- Sylvie L and Xiaoyan L (2005).** Consumers' Attitudes towards Online and Mobile Banking in China. *International Journal of Bank Marketing* **23**(5) 362-380.
- Sylwester J and Kozak K (2005).** The Role of information Technology in the profit and cost Efficiency Improvements of Banking Sector. *Journal of Academy of Business and Economics*, available: www.findarticle.com/articles/mi-nb3198.
- Tero P, Kari P, Heikki K and Seppo P (2004).** Consumer Acceptance of Online Banking: An Extension of the Technology Acceptance Model. *Internet Research* **14**(3) 224-235.