Online banking acceptance: The influence of perceived system security on perceived system quality

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Abstract: Increasing popularity of online banking systems instead of traditional branch networking requires understanding customer behaviors as users of such systems. This research aims to investigate online banking acceptance among Bosnian university students by considering system, user, acceptance and performance related factors by considering a new relationship between perceived system security and perceived system quality. According to the results, the users perceive that (1) online banking system is not secure and poorly qualified but useful and easy to use; (2) the users themselves are slightly capable of using the system; (3) they have intention to use the system but don't use the system; and (4) they are slightly satisfied with the system and increase their benefits. The results also provide that all hypotheses except the relationship between perceived ease of use and intention to use are supported. Perceived System Security, as a new dimension, is found to have positive effect on Perceived System Quality. It can be implied that if the system is qualified and the users are self-efficient about using the system, they perceive the system as easy to use and useful. It is suggested that banks better take necessary steps to persuade their customers about the system security and usefulness in completing their tasks.

Keywords: technology acceptance, perceived system security, university students, survey

JEL codes: L86, M15

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1. Introduction

Increased new understandings and changing consumer preferences, as a result of globalization, require new strategies to attract customers and maintain their loyalty. One of the most fundamental changes in banking industry is the movement from traditional branch networking to electronic or online banking which requires understanding customer behaviors and responding accordingly (Yiu *et al.*, 2007).

Besides the required high investments for the implementation of online banking systems, the implemented systems may not be welcomed by potential users. So, it is critical to identify the factors and their roles in online banking adoption and its success in order to prevent the possible failures and loses and to enhance the operations.

This study aims to investigate the acceptance of online banking in Bosnia and Herzegovina by exploring its decisive factors (system, user, acceptance and performance). The main contribution of this research is adding a new relationship, between perceived system security and perceived system quality, to an acceptance model.

In order to test the model, the data is collected by surveying the students in two private universities in Bosnia and Herzegovina. Although the results of model test support all relationships except the one between perceived ease of use and intention to use, the research is weak in explaining the model (low explanatory levels) regarding the considered variables and the associations among them. Descriptive analyses, in general, do not provide strong results for model components too.

By explaining users' perceptions, the findings of this research are expected to help online banking authorities in identifying their potential customers' online banking adoption behavior while determining their strategies and planning their operations. Moreover, the study is assumed to enrich Bosnian literature by providing some empirical evidence about online banking adoption and success.

In the following sections of the paper, necessary components of this research are provided. The literature review regarding online banking acceptance is briefly introduced and the constructed model is presented. Furthermore, the methodology used in the study is described and the results are presented. In the conclusion part, findings are discussed and implications are addressed.

2. Online banking

As a result of market forces, industrial and service sectors have witnessed rapid shifts in the way of doing their business. Information technology (IT), as a major force, is used to eliminate geographical, industrial, and regulatory barriers; to generate new products/services and market opportunities; and to develop agile business and management processes (Liao & Cheung, 2002).

Banking sector is also influenced by information technology in terms of providing more flexible payment methods and more user-friendly services. Since the mid-1990s, there is a fundamental change in banking delivery channels in terms of self-service channels such as electronic banking, the use of automated teller machines (ATMs) and online banking systems which are quite influential in changing the transaction styles of bank clients (Qureshi *et al.*, 2008).

Online banking systems allow customers to access and perform their financial transactions on their bank accounts through web-enabled computers (Ongkasuwan & Tantichattanon, 2002) or their mobile phones (Arunachalam & Sivasubramanian, 2007) with direct Internet connection to banks' web sites.

Given that online banking and other electronic payment systems are expected to enhance the efficiency and effectiveness of banking system, they deserve special attention because of their importance and complexity (Ortega *et al.*, 2007). Human factors are quite influential on the complexity of such systems. Therefore, the underlying factors of online banking acceptance need to be defined properly in order to increase the benefits of using these systems.

3. Online banking acceptance

Technology acceptance has been an important concern among IS researchers for more than two decades. Technology Acceptance Model (TAM) (Davis, 1989), one of the oldest acceptance models, is the most recognized model in the literature. It suggests perceived usefulness (PU) and Perceived Ease of Use (PEOU) as significant factors affecting acceptance of an information system. While PU is "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989), PEOU is "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989).

Beside wide use and extensions in different settings, technology acceptance models are used in the adoption of online banking systems too (Pikkarainen *et al.*, 2004; Wang *et al.*, 2006; Hamadi, 2010). Online banking adoption behavior of different samples from different countries are available in the literature such as Malaysia

(Ariff *et al*., 2012), Taiwan (Luarn and Lin, 2005), Hong Kong (Cheng *et al*., 2006; Yiu *et al*., 2007), Saudi Arabia (Al-Somali *et al*., 2009), and Bosnia and Herzegovina (Özlen & Jukic, 2013; Kozaric & Zunic, 2014; Makarevic, 2016).

Different forms and extensions of technology acceptance models exist in the literature too. Fundamental theories used to develop such models are the theory of planned behavior (TPB) (Ajzen, 1988; 1991) and innovation diffusion theory (IDT) (Rogers, 1995).

The variables such as *enjoyment*, as the perception of whether using a computer is enjoyable or not (Davis *et al.*, 1992), *Perceived Financial Cost* (Wu and Wang, 2005; Luarn & Lin, 2005), *online banking awareness* (Sathye, 1999; Al-Somali *et al*., 2009), *online banking security risks* (Roboff & Charles, 1998), *perceived risk* (Wu and Wang, 2005), *the quality of Internet connection* (Sathye, 1999; Al-Somali *et al*., 2009), *users' self-efficacy* as the judgment of one's ability to use online banking (Vijayasarathy, 2004; Luarn & Lin, 2005), *Perceived Credibility*-a trust-based construct as the extent to which a person believes that the use of mobile banking has no security or privacy threats (Wang *et al.*, 2003; Vijayasarathy, 2004; Luarn & Lin, 2005), *Computer Self-Efficacy* (CSE) (Al-Somali *et al*., 2009; Ariff *et al*., 2012), *the social influence* (Al-Somali *et al*., 2009), compatibility (Vijayasarathy, 2004), and *perceived web security* (Salisbury *et al.*, 2001; Vijayasarathy, 2004; Cheng *et al*., 2006) are used in the adoption of online banking systems.

Providing the security of online transactions, earning the trust of customers and customer behaviour are reported among the fundamental challenges in internet banking (Özlen & Jukic, 2013) and online commerce adoption (Gefen *et al.*, 2003). Wang *et al.* (2006) assume that the perceived system quality influences Online banking user satisfaction as well as PEOU, design, security, privacy, information, saving time and interactivity of online services. Security, maybe one of the main concerns of mankind, is defined as a customer's perception about her individual information security (nobody can access her account).

Besides analyzing IS acceptance, scholars go beyond and explore the performance of successful adoption of IS through IS success theories and models. One of the most prominent IS success models is introduced by first DeLone and McLean in 1992 which is later updated in 2003. The initial model includes System Quality, Information Quality, Use, User Satisfaction and performance variables (Individual Impact and Organizational Impact) (DeLone & McLean, 1992). The updated model additionally employs Service Quality and Intention to Use. Moreover, they consider Individual Impact and Organizational Impact under Net Benefits (DeLone & McLean, 2003).

The reliability and robustness of the technology acceptance models have been supported in IS adoption literature especially with PU and PEOU (Vijayasarathy, 2004) beside surprising results for perceived ease of use. Wu and Wang (2005) observe that all variables except perceived ease of use significantly influence behavioral intention to use.

Given that the technology acceptance model (TAM) has been widely employed in acceptance of new technologies, some of its poor aspects such as lack of incorporating social structure and acceptance are also reported (Hossain & Silva, 2009).

4. Online banking in BiH

Since big banks are generally in foreign ownership and small banks in domestic private ownership, e-banking systems of Bosnian banks are not well established (Zivko, 2005). Low computer literacy, low income and low internet access are reported among the main problems in using e-banking in Bosnia and Herzegovina (BiH) (Zivko, 2005). While the adoption rate of online banking services is reported as high in many parts of the world (Pikkarainen *et al.*, 2004), Bosnian Central Bank officially reports the increase in the individual and enterprise use of e-banking services and customer acceptance ratio of online banking systems in BiH. According to the official report of the Central Bank of BiH (2012) for the year 2011, 70.474 citizens and 23.865 corporations, organizations and firms used e-banking services. It is later reported that the number of online banking users has increased by over 100,000 clients (47.39%) for the year 2014 (The Central Bank of Bosnia and Herzegovina, 2015). Moreover, all Bosnian banks are reported to be offering Online banking services for their customers (The Central Bank of Bosnia and Herzegovina, 2012).

Online banking studies in BiH generally provide descriptive results about online banking usage behavior of the target population. Kozaric and Zunic (2014) identify that education and income level affect e-banking usage in Bosnia and Herzegovina. Makarevic (2016) compares perceptions of Bosnian and Croatian clients of online banking about IT security and identifies that Croatian e-banking users trust banks more than Bosnian users in terms of IT security of online banking. He also finds out that Croatian clients are aware more of potential security threats and managing money online while Bosnian clients trust less in online banking and knows less to improve security of their personal online banking experience.

Low level of client's trust in Bosnia for banking sector is an important barrier for the development of banking sector and therefore their e-banking systems. Security barrier is accepted as a serious barrier for the acceptance of e-banking (Zivko, 2005).

5. Proposed model

Based on the above mentioned relationships among the constructs, we propose a comprehensive model of online banking acceptance and effectiveness (Figure 1). Employed constructs are Perceived System Security (PSS), Perceived System Quality (PSQ), User Self-Efficacy (USE), Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Intention to Use (ITU), Online Banking Use (OBU), User Satisfaction (US) and Individual Performance (IP). The assumed associations among the constructs are designed by considering the previous studies except the relationship between perceived system security and perceived system quality. This study differs from the other studies in that Perceived system security is employed in the model instead of Perceived Web Security (Salisbury *et al*., 2001; Cheng *et al*., 2006). Salisbury *et al*. (2001) and Cheng *et al*. (2006) suggest that perceived web security enhances the attitude towards using the system. However, our contribution is the relationship between Perceived System Security and Perceived System Quality.

It is assumed that secure systems enhance the quality of the system. If the users feel themselves as capable of using the system (self efficacy) and the systems are perceived as qualified, they feel the systems as useful and ease to use. Therefore, they have intention to use the system and use the system. If they use the system, they become more satisfied about their transactions and their performance is increased.
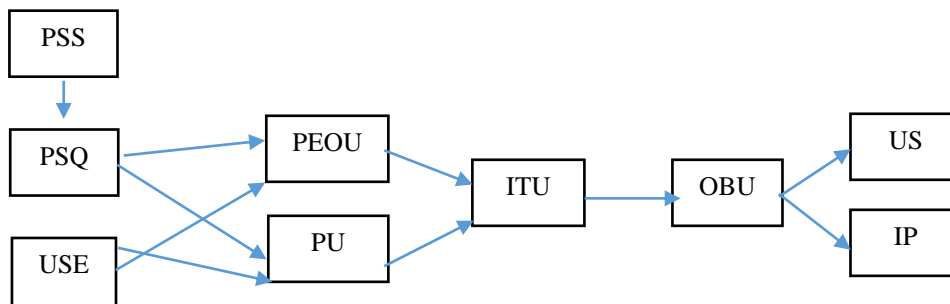

Figure 1. Research model

6. Data and methodology

University students from several departments of two Bosnian private universities in Sarajevo are targeted as the population for data collection of two months. Convenience sampling is preferred while selecting the participants. Young university students are found to be easy to reach and persuade for completing the

survey. The surveys are distributed as both hard-copy and online. At the end of data collection period, 124 survey forms are achieved, 120 of them are evaluated as useful for analysis and four copies are not considered because of many unfilled sections. Seven point Likert scale (1=strongly disagree and 7=strongly agree) are used to test the agreement levels of the respondents on nine variables. The data is analyzed via SPSS program version 20.0.

The collected data is analyzed descriptively and the relationships among the variables are tested by regression analysis. Before applying regression analysis, the items of variables are tested by factor analysis in order to evaluate the validity of constructs.

7. Results

Demographic information of respondents (gender, education level and department) is illustrated in Figure 2. Almost two thirds of the respondents (65%) are male students. Undergraduate students (89% of the sample) have completed the survey from several departments (46% management department, 24% engineering department, 5% education department and 25% other departments).
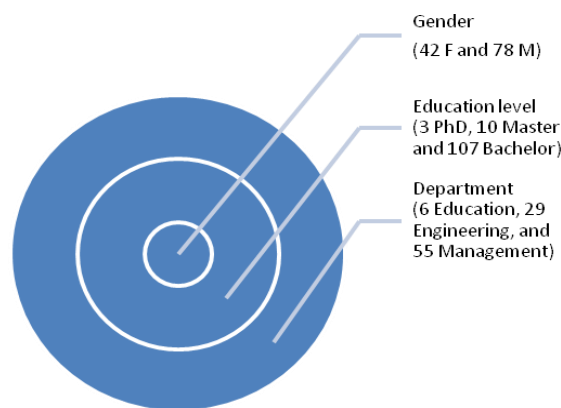

Figure 2. Demographic information

7.1 Descriptive analysis

Descriptive analysis results reveal not strong values for the evaluated constructs. As observed from Table 1, the users perceive that (1) online banking system is slightly qualified but not secure; (2) they are not self-efficient to use the system; (3) the system is easy to use and useful; (4) they have intention to use the system but they don't use the system; (5) they are slightly satisfied with the system and (6) somewhat increased their performance.

7.2 Research model test

The constructs are also tested by factor analysis and at the end; none of the items under the assumed dimensions are removed from the analysis. The dimensions are identified to be strong in terms of their reliability (high Cronbach's Alpha results) and the validity (item-factor correlations). According to KMO measures, the data, in terms of sample size, is identified to be proper in order to run the analysis (Table 1).

Table 1. Factor analysis results and variable arithmetic means

Factor	N of Items	Mean	Item-Factor Correlations Interval for Item Loadings	Sampling Adequacy KMO Measure	Reliability Statistics Cronbach's Alpha
Perceived System Quality	4	4.12	0.780-0.858	0.815	0.843
Perceived System Security	1	3.77	---	---	---
User Self Efficacy	4	3.98	0.795-0.882	0.742	0.855
Perceived Ease of Use	5	4.77	0.845-0.929	0.851	0.929
Perceived Usefulness	4	5.21	0.854-0.901	0.766	0.903
Intention to Use	5	4.24	0.791-0.881	0.806	0.887
Online Banking Usage	2	3.56	0.957-0.957	0.500	0.907
User Satisfaction	7	4.08	0.814-0.902	0.913	0.941
Individual Performance	4	4.31	0.864-0.904	0.805	0.909

Linear Regression is employed to test the proposed relationships after determining the strengths of model constructs by factor analysis. The regression analysis reveal that (a) almost all (9/10) hypothesized relationships are significantly supported; (b) (see Adjusted R Square values) two associations have moderate explanatory power (0.420 and 0.394); four relationships have weak explanatory power (0.254; 0.213; 0.267 and 0.223); and one has very weak explanatory power (0.173); (c) (see Standardized Coefficients) two relationships are strong (0.632 and 0.523), five

relationships are moderate (0,387; 0.396; 0.344; 0.390; 0.424; 0.479) and one relationship is weak (0.271).

Table 2. Regression analysis results

Relations		Adjusted R	Standardized	Sig.
Independent	Dependent	Square	Coefficients	
PSQ	PEOU	0.420	0.387	***
USE			0.396	***
PSQ	PU	0.254	0.344	***
USE			0.271	***
PSS	PSQ	0.394	0.632	***
PEOU	ITU	0.213	0.116	.296
PU			0.390	***
ITU	OBU	0.267	0.523	***
OBU	US	0.173	0.424	***
OBU	IP	0.223	0.479	***
***: p<0.001				

According to the results of Regression analysis, it is identified that (1) PEOU and PU are significantly enhanced by PSQ and USE; (2) PSQ is increased by PSS; (3) PU is (PEOU is not) influential on ITU; (4) ITU positively affects OBU; and (5) OBU contributes to both US and IP (Figure 2).
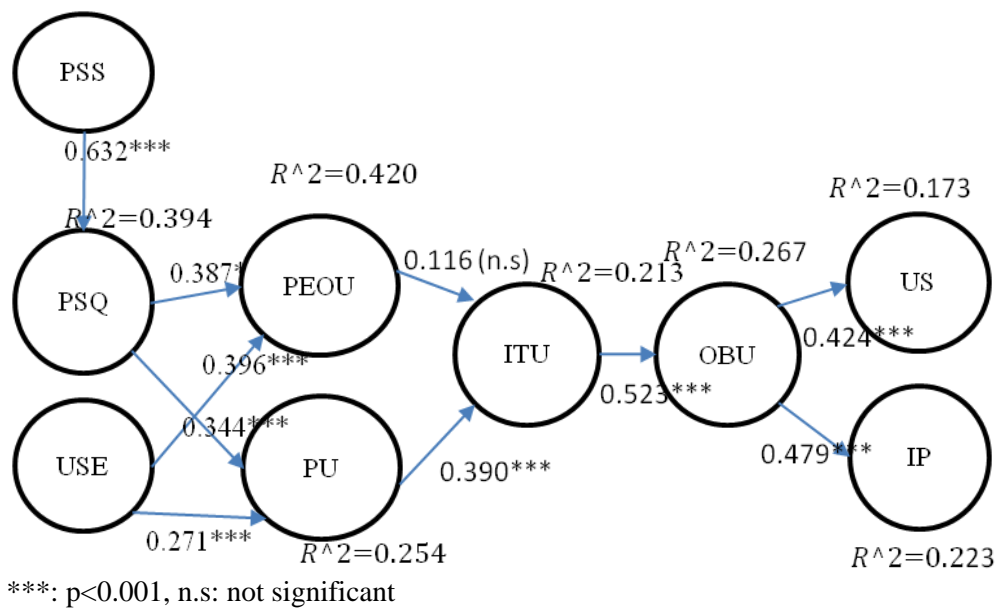

***: p<0.001, n.s: not significant

Figure 2. Power of relationships

8. Conclusion

Given the importance of the identification of the factors and their roles in online banking adoption and success, this research fundamentally aims to investigate perceptions of students in two private Bosnian universities about online banking acceptance. The model embraces system, user, acceptance and performance related factors. This research mainly differs from the other studies by adding a new relationship, between perceived system security and perceived system quality, to an acceptance model.

Descriptive statistics cannot provide strong values for each dimension in the model. In terms of system, it is observed that the users perceive online banking system as not secure and poorly qualified. However, the system is accepted as useful and easy to use. Regarding users, the respondents have poor beliefs about their ability to use the system. When we consider the acceptance, users have intention to use the system however they don't use the system. In the sense of performance, users are slightly satisfied with the system and slightly feel an increase in their benefits.

In terms of model test, it is identified that all associations except one (the relationship between PEOU and ITU) are supported. Perceived System Security, as the new dimension of our model, is identified to have positive impact on Perceived System Quality implying that more secure systems increases the quality of the used systems.

While the literature generally suggests positive relationship between PEOU and Intention to Use, it is surprisingly identified that PEOU has no significant influence on ITU indicating that the users, while using the system, do not consider whether the system is easy to use or not. However, according to the results, if the users find the system useful, they intend to use the system. The literature rarely reports (Wu and Wang, 2005) not significant relationship between PEOU and ITU.

Despite online banking system in BiH is perceived as easy to use and useful, it is quite obvious that nobody use a system if the system is not felt secure (therefore not qualified) and the users feel that they are not capable of using the system. As a result of poor system acceptance, users clearly cannot be satisfied and increase their performance. Therefore, it is suggested that Bosnian banks better improve both the security of their systems and the perceptions of their customers' beliefs in that online banking system provides high security for their transactions. Banks better periodically acknowledge their existing and potential customers about the security of online banking systems to increase customer trust and familiarity for the online systems and therefore to minimize legal and reputational risk associated with online banking activities.

Beside the identified significant results, the research is weak in that the model is not well explained (low explanatory levels) regarding the considered variables and the associations among them. It may be implied that Bosnian university students' online banking acceptance should be explained by considering different variables. It is suggested that high response rates and different target populations probably solve the problem. Low means (see Table 1) may be the indicators of these weak explanations and associations. It is therefore suggested that banks better evaluate each model dimension individually and develop strategies to enhance their performance.

The main contribution of this research, despite not well explained associations and their power, is the new relationship, which is found to be significant, between perceived system security and perceived system quality. Furthermore, this study is expected to be useful for Bosnian banks in identifying their customers' online banking adoption behavior while determining their strategies and planning their operations. Moreover, the study is expected to be beneficial for weak Bosnian literature by providing some empirical evidence about online banking adoption and effectiveness.

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Appendix: Survey questions

	Online Banking System Security	Agreement Level
1	Online banking system in BiH provides necessary security in the transactions	1 2 3 4 5 6 7

	Online Banking System Quality	Agreement Level
1	Online banking system in BiH perfectly allows the flow of necessary information	1 2 3 4 5 6 7
2	Online banking system in BiH saves time in the transactions	1 2 3 4 5 6 7
3	Online banking system in BiH enhances the interactivity among the parties	1 2 3 4 5 6 7

	User Self-Efficacy	Agreement Level
1	I have necessary information about using online banking	1 2 3 4 5 6 7
2	I have necessary experience to use online banking	1 2 3 4 5 6 7
3	I have necessary skills to use online banking	1 2 3 4 5 6 7
4	I have necessary equipment to use online banking	1 2 3 4 5 6 7

	Perceived Ease of Use	Agreement Level
1	Using online banking is very simple	1 2 3 4 5 6 7
2	Online banking is easy to use	1 2 3 4 5 6 7
3	Online banking is easy to learn how to use	1 2 3 4 5 6 7
4	Online banking is accessible from anywhere at anytime	1 2 3 4 5 6 7
5	Online banking is quick to make the transactions	1 2 3 4 5 6 7

	Perceived Ease of Usefulness	Agreement Level
1	Online banking is useful for people's current life style	1 2 3 4 5 6 7
2	Online banking provides faster transactions	1 2 3 4 5 6 7
3	The cost of using online banking is very low	1 2 3 4 5 6 7
4	I can save time by using online banking services	1 2 3 4 5 6 7

	Intention to Use Online Banking	Agreement Level
1	I seek to use online banking wherever/whenever possible	1 2 3 4 5 6 7
2	I prefer using online banking methods instead of other ways	1 2 3 4 5 6 7
3	I recommend others to use online banking	1 2 3 4 5 6 7
4	I will use online banking on regular basis in the future	1 2 3 4 5 6 7
5	I intend to increase my use of online banking in the future	1 2 3 4 5 6 7

	Online Banking Usage	Agreement Level
1	I use Online banking in order to make my transactions	1 2 3 4 5 6 7
2	I use Online banking in order to track my account	1 2 3 4 5 6 7

	Satisfaction	Agreement Level
1	I am satisfied with the speed of Online banking services	1 2 3 4 5 6 7
2	I am satisfied with the quality of Online banking services	1 2 3 4 5 6 7
3	I am satisfied with the costs of Online banking services	1 2 3 4 5 6 7

4	I am satisfied with the efficiency of Online banking services	1 2 3 4 5 6 7
5	I am satisfied with the usage of Online banking services	1 2 3 4 5 6 7
6	I am satisfied with the reliability of Online banking services	1 2 3 4 5 6 7
7	I am satisfied with the portability of Online banking services	1 2 3 4 5 6 7

	Individual Performance	**Agreement Level**
1	I have reduced the time for my transactions	1 2 3 4 5 6 7
2	I have reduced the costs for my transactions	1 2 3 4 5 6 7
3	The efficiency/effectiveness of my transactions has improved	1 2 3 4 5 6 7
4	I have increased the reliability of my transactions	1 2 3 4 5 6 7