

# INFLUENCE OF SECURITY AND TRUST ON ELECTRONIC BANKING ADOPTION IN SLOVAKIA

*Martin Vejačka, Tomáš Štofa*

## Introduction

The rapid development of information and communication technologies (ICT) in recent years has brought major changes in many areas of the economy and even created its new sectors. Rising complexity of technological and heterogeneity of technological infrastructure and their applications contributed to changes in every business area (Voříšek et al., 2015). New opportunities to sell products and provide services arose in the electronic environment. Customers routinely buy in e-shops and electronic banking became a very important form of banking services usage in last two decades. Improvements in information and communication technologies have positively influenced also areas like retail commerce, banking, public administration, healthcare administration (Šoltés & Gavurová, 2014) and many others. Significant changes occurred in the provision of banking services. Some of the forms of electronic banking quickly became old and out-dated (e.g. Wireless Application Protocol – WAP banking). Faster data transmissions within mobile networks and the Internet allowed multiple innovations and improvements of electronic banking forms. The form of electronic banking growing fast in numbers of users is mobile banking in smartphones and tablets (and other devices). This form of mobile banking uses dedicated application installed in mobile device allowing active usage of banking services, although for communication with the bank it uses mostly the Internet (mobile network, Wi-Fi etc.).

Claessens et al. (2002) adduced that electronic provision of banking services brings many benefits to its users and also to providers, e.g. cost savings for both sides of banking services, higher speed of service, almost unlimited availability and higher conformability. When clients want to benefit from electronic banking, they must trust in electronic banking.

In general, trust in information and communication technology affects the adoption of ICT. Additionally, information and communication technologies may promote trust while they allow faster and more reliable acquisition of information and support transparency. Delina and Dráb (2010) stated that trust within the electronic environment is often connected with reputation mechanisms, which allows reputation assigning to the both sides of the commercial relationship to assess their trustworthiness. In the case of e-commerce trustworthy seller (the one that sends his goods on time and in demanded quality and quantity) should have high reputation generated by previous sales.

Multiple publicized cases of major security failures have increased public concerns about electronic commerce and reduced their trust in it. This is especially true for the area of electronic banking as one of the areas of e-commerce while customers are more concerned about security when the process includes sensitive personal information. In electronic banking, sensitive personal financial information is manipulated and its customers are concerned about the security issues of e-banking form what may inhibit their use of electronic banking.

In the case of electronic banking, the provider of electronic banking service is banking institution, which is liable to various banking committees and supervising authorities. So clients of electronic banking services have a high level of certainty that the other side of this commercial relationship (the bank) is a serious and trustworthy partner under the supervision of higher authority. On the other hand, electronic banking uses various electronic environments where abuse might be unseen until the very last moment. Attacks by third parties on electronic banking of its users (e.g. phishing, pharming etc.) might be a source of risk that dissuades

potential users from e-banking usage. Therefore banks are trying to prevent such a threat by increasing level of electronic banking security and safety of its use.

Lev-On (2009) explored the importance of trust in an online environment and pointed out the difference between security and trust. Hawkins and Sato (2004) investigated the trust in electronic finance and banking with finding that both non-technical and technical aspects of trust building must be covered to provide confidence and trust for users in this area by financial and banking institutions. Trust in electronic banking providers is generated mainly by bank supervision and dispensing of banking license by higher authorities.

Competition among banks in retail area pushes them to improve also comfort and security of their electronic banking services, although occasional cases of e-banking abuses noted in media might disrupt the confidence of electronic banking users as stated Dandapani (2004). Furthermore establishing, adopting and strict application of security procedures and policy in electronic banking is an issue according to Simpson (2002).

Potential bank clients might sense both multiple advantages and risks of electronic banking when deciding whether to adopt it or not. Faster service, great availability and higher comfort of use are benefits attracting potential users to the electronic banking. On the other hand, doubts about safety and security of electronic banking might impede its adoption by potential clients. Further banks are seeking costs reduction, higher efficiency, customer satisfaction and possibility to serve to more customers at once when introducing electronic banking (Mittal & Kumra, 2004; Berger et al., 2007).

Electronic banking acceptance in Slovakia was investigated in Vejačka (2014), however, trust in electronic banking was not considered specifically. Investigation of the influence of trust and security on electronic banking adoption in the conditions of retail banking in Slovakia will be the main goal of this paper. The extent of the influence of further identified factors on electronic banking adoption by its potential users in Slovakia will be investigated.

## 1. Literature Review

Many research studies investigate customer acceptance of internet banking or electronic banking in general (including other forms of

e-banking besides internet banking). The most of these studies are based on the Technology Acceptance Model established by Davis (1989). Technology Acceptance Model (TAM) detects factors of perceived usefulness, perceived ease of use, and awareness of particular technology investigated. In studies dedicated to electronic banking, the TAM is often further extended or adapted by some specific aspects of electronic banking technology to investigate their influence on electronic banking acceptance (e.g. Venkatesh & Davis, 2000). TAM serves for development of the research model, which is further verified by factor analysis, which can test how well the measured variables represent the number of factors, firstly developed by Jöreskog (1969).

Pikkarainen et al. (2004) detected web information about electronic banking service as one of the main factors predicting acceptance of given service. Teo et al. (1999) included in their version of TAM also perceived enjoyment. It was detected as a significant inherent motivator to information system usage.

Cheng et al. (2006) investigated the acceptance of internet banking in Hong Kong using Technology Acceptance Model. Their research results indicated the suitability of using TAM for investigating customer's acceptance of internet banking. Qureshi et al. (2008) also confirmed TAM as suitable for online banking acceptance prediction using data from developing countries.

Agarwal and Karahanna (2000) extended TAM with perceived playfulness and ascertained that perceived playfulness is prior to the perceived ease of use and perceived usefulness. Furthermore, Moon and Kim (2001) detected its significant influence of customer technology adoption in the world-wide-web context. Werber et al. (2015) indicated that computer literacy is a key factor in adopting new information and communication technology.

Multiple authors aimed their research to the effects of trust on acceptance of various technologies, like e-commerce and electronic banking. Jarvenpaa et al. (2000) investigated purchase behavior at online stores. According to their findings trust influences perception of risk and attitude toward purchase at given online store and trust itself was influenced by the perceived reputation and size of the store.

Gefen (2002) examined the influence of trust on purchase intentions in an online

environment and detected the significant influence of trust, which is further affected by benevolence and integrity. Influences on the intent to make Internet purchases were also investigated by George (2002), who detected privacy and the Internet trustworthiness as main significant factors affecting the decision about purchases on the Internet. Gefen et al. (2003) later investigated purchase intentions of experienced and inexperienced customers in online stores and ascertained the significant effect of disposition to trust and familiarity on trust, which significantly influences customers' intentions to purchase.

Bhattacharjee (2002) examined if the consumers are complaisant to make online transactions. His results suggested that compliance to transact online is affected by familiarity and trust. Trust has a significant effect on willingness to transact according to Pavlou (2003) and is a determinant of perceived usefulness in an online environment.

In general, the low trust in an electronic environment is often considered as an important barrier to wider proliferation of electronic banking (Yousafzai et al., 2009). The results of Aladwani (2001) and Lee and Turban (2001) showed that privacy and security concerns hinder the adoption of Internet banking and lower trust. Suh and Han (2002) detected trust's significant influence on attitude towards using Internet banking and its overall acceptance by potential users. Sohail and Shanmugham (2003) found out that trust in customer's bank has a significant effect also on Internet banking adoption by given customer among other factors like security concerns, attitude towards change and availability of the Internet.

Many researchers examined also the influence of security on trust in electronic banking and consequently on its adoption by potential users. Pikkarainen et al. (2004) did not detect the influence of security on electronic banking acceptance. The research of Widjana and Rachmat (2011) also showed similar results. On the other hand, many studies detected importance of security and safety when introducing electronic banking to their potential users. Roboff and Charles (1998) detected importance of privacy of financial information in cyberspace and suggested banks to address consumers' concerns in this area. Chellappa and Pavlou (2002) adduced that security concerns very often accompany an introduction of new

information technologies. Then, the acceptance of these novel technologies depends on preventing of security threats, improving the perception of security by consumers and building their trust in given technology. Hamlet and Strube (2000) indicated that safety of online banking perceived by bank clients will affect its adoption. Dzemydienė et al. (2010) explored security disturbance risks in electronic banking systems. According to their results, multiple risk factors and the implementation of modern ICT technologies increase the security of electronic payment security and significant efforts must be made to build the trust by prevention of security risks.

Alsajjan and Dennis (2006) investigated the influence of trust on sensitive information use in online banking and on user's acceptance of electronic payments. The results of Grabner-Kräuter and Faullant (2008) showed a significant influence of privacy on customer attitudes towards internet banking on risk perception while using it. Qureshi et al. (2008) ascertained that high perceived security of online banking together with perceived usefulness led to a significant shift from traditional banking to electronic banking. Good security and privacy levels according to findings of Geetha and Malarvizhi (2011) increased the adoption of electronic banking services by banking customers in India. Acceptance of electronic banking by customers, in this case, was also affected by safety guidance from bank's side.

Alsajjan and Dennis (2010) examined the managerial side of consumer acceptance of internet banking. Internet banking customer must perceive electronic transactions as safe and easy to promote internet banking adoption. It builds a trust in internet banking in a significant way according to their findings. Furthermore, banks should create their reputation as innovative institutions and promote positive perception and trustworthiness in eyes of potential customers. For these promotional purposes, banks should use digital media like blogs, social networks and emails.

Kumar et al. (2012) highlighted the importance of the reducing the risk of the internet banking customer by bank's structures, including security, assurances, service quality and benevolent policies. They also detected the effects of the individual's customers' attitude towards the internet and internet banking on the disposition to trust. The banks

should communicate to users all its benevolent policies to enhance the level of the internet banking usage in order to positively influence their disposition to trust with the aim to increase the level of the internet banking usage.

Researchers often explore the acceptance of online banking, aiming their research only on internet banking. However, customers might use more forms of electronic banking at present. Mobile banking using internet connection (in the case of Slovakia called Smart banking) or mobile network is a most common alternative to internet banking. In many countries around the world, investigations on electronic banking adoption by customers were realized during recent years, e.g. in Australia (Sathye, 1999), Turkey (Polatoglu & Ekin, 2001), United Kingdom (Howcroft et al., 2002), Finland (Karjaluoto et al., 2002), Hong Kong (Cheng et al., 2006), Pakistan (Qureshi, 2008), India (Geetha & Malarvizhi, 2011), Romania (Moga et al., 2012), Nigeria (Popoola, 2013) or in Vietnam (Nguyen et al., 2014).

A similar investigation of electronic banking adoption in Slovakia was conducted (Vejačka, 2014). However, this research was not aimed at security and trust influence on electronic banking acceptance. Therefore the issue of trust and security influencing electronic banking adoption by potential users in Slovakia will be the focus of this study.

## 2. Research Model

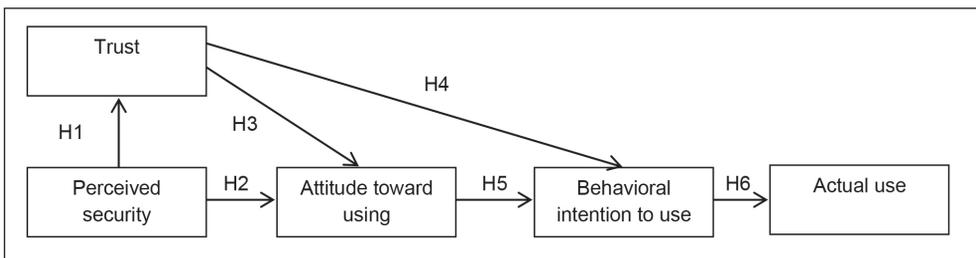
Multiple models of trust within the environment of electronic banking or services were used during investigations. McKnight et al. (2002) suggested the trust model on the web. In this model, the adoption of the e-commerce

system depends on the customers' trust in the web, which is related to trusting beliefs and disposition to the trust of the customer. Kumar et al. (2012) adopted this model for use in case of internet banking (that can be considered as an extension of e-commerce) to reflect various technology-related trust dimensions influencing the institution-based trust.

According to Tan and Thoen (2001), trust is determined by four basic beliefs: competence belief, dependence belief, disposition belief and fulfillment belief, while competence belief reflects the usefulness of supplier of product or service perceived by the customer. The same assumption can be applied to electronic banking or basically to any information technology. Perceived usefulness is one of acceptance factors according to TAM developed by Davis et al. (1989). Suh and Han (2002) extended TAM with the concept of trust influencing attitude toward using and behavioral intention to use, while trust itself is influenced by perceived usefulness and in turn by perceived ease of use.

In this research, foundations of technology acceptance model are used with modifications similar to those made in the study of Suh and Han (2002). However, factors of perceived usefulness and perceived ease of use are not considered because their influence is well investigated in many studies using TAM. In our study perceived security is examined instead, while it is one of the basic aims of our research. Influence of both, perceived usefulness and perceived ease of use on electronic banking acceptance, was already investigated in Slovak conditions (Vejačka, 2014). However, in this research, the influence of security and trust on electronic banking acceptance will

Fig. 1: Research model



Source: own

be investigated together with the effect of perceived security on trust in electronic banking. The constructed research model is graphically presented in Fig. 1.

According to model following research hypotheses are formulated:

*H1: Perceived security has a positive impact on customer's trust in electronic banking.*

Kumar et al. (2012) found that security of internet banking perceived by users has significant positive influence on institution-based trust in internet banking. It can be generalized also for other forms of electronic banking. Sanayei and Noroozi (2009) stated that trust is increased and positively associated with the perceived level of security.

*H2: Perceived security has a positive impact on customer's attitude toward using electronic banking.*

The security mechanisms support customers' confidence to interact with electronic banking according to Suh and Han (2002). Liao and Cheung (2002) suggested that the visibility of these security mechanisms to the users is important and influences customer's attitude toward using internet banking or electronic banking in general.

*H3: Customer's trust has a positive impact on customer's attitude toward using electronic banking.*

Customer's trust in store positively influences attitude toward using given store according to Macintosh and Lockshin (1997) and attitude is one of the components of store loyalty. Also, Jarvenpaa et al. (2000) suggested that customer trust in an online store strongly influences attitude toward using particular online store.

*H4: Customer's trust has a positive impact on customer's intention to use electronic banking.*

Influence of trust on behavioral intention to use any service was investigated mainly in the marketing area. Gefen et al. (2003) suggested that trust positively influences buyer's intention to use the online store of the seller.

This hypothesis was adopted for the case of electronic banking usage.

*H5: Customer's attitude toward using electronic banking has a positive impact on customer's intention to use electronic banking.*

Suh and Han (2002) verified in their study that customer's attitude toward using internet banking has a positive impact on his/her actual use of it. This hypothesis has been modified to the form for all electronic banking forms and is part of our research model.

*H6: Customer's intention to use electronic banking has a positive impact on customer's actual use of electronic banking.*

Again, Suh and Han (2002) investigated and confirmed positive impact of customer's intention to use internet banking on actual use of it. Also, this hypothesis is incorporated in form of influence of electronic banking in our research model.

### 3. Methodology

Our research model mentioned in previous chapter was developed on the basis of the Technology Acceptance Modelling (TAM) approach with factors of perceived security, trust, attitude towards using and behavioral intention to use electronic banking. With an aim to verify our research model, data was gathered using an online survey. The questionnaire survey was aimed to investigate factors influencing electronic banking adoption showed in our research model.

Potential factors of were further investigated by confirmatory factor analysis, which is contemporary technique for assessing the construct validity of multiple attempts to measure the same concept being in agreement. Confirmatory factor analysis is a multivariate statistical procedure that is used to test how well the measured variables represent the number of constructs (factors). It is a tool that is used to confirm or reject the measurement theory. It was developed by Jöreskog (1969). Confirmatory factor analysis serves to detect factors accounting for the covariance in the measures, while these factors are being unrelated to each another. The theoretical measurement model is compared with the reality model to detect how well the data fits. Chi-square test

and other goodness of fit statistics like root mean square residual, goodness-of-fit index, normed fit index, comparative fit index are key indicators that might indicate measuring the model validity, i.e. how well the proposed model captured the covariance between all the items or measures in the model (Hair & Black, 2010). If the constraints the researcher has imposed on the model are inconsistent with the sample data, then the results of statistical tests of model fit will indicate a poor fit, and the model will be rejected. If the fit is poor, it may suggest that some items measuring multiple factors, or some items within a factor are more related to each other than others. Confirmatory factor analysis is often used in technology acceptance studies, like Suh and Han (2002), Cheng et al. (2006), Kumar et al. (2012), Nguyen et al. (2014) etc.

Principal axis factoring is a confirmatory factor analysis method used in technology acceptance studies (Cheng et al., 2006) and its suitability is detected by Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. Bartlett's test of sphericity can confirm factorability, while it compares the observed correlation matrix to the identity matrix. It detects if there is a certain redundancy between the variables that can be summarized by a few number of factors. If the variables are perfectly correlated, only one factor is sufficient. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy compares the values of correlations between variables and those of the partial correlations. If the KMO is close to one, the principal axis factoring can act efficiently; if it is KMO is close to zero, the principal axis factoring is not relevant (Kumar et al., 2012). As internal consistency reliability measure, the Cronbach's alpha was used, similarly as in Hair and Black (2010). Cronbach's alpha is the expected correlation of two tests that measure the same construct.

Factor analysis is frequently used as a first step to assess the proposed measurement model in a structural equation model (SEM). Many of the rules of interpretation regarding assessment of model fit and model modification in structural equation modeling apply equally to confirmatory factor analysis. While in confirmatory factor analysis factors are not presumed to directly cause one another, SEM often specifies particular factors and variables to be causal in nature (Hox & Bechger, 1998). Therefore, the Structural Equation Modelling

(SEM) approach was further used to show relations between variables in our research model. Fundamentally, SEM is a term for a large set of techniques based on the general linear model and it has the ability to test relationships between constructs comprised from multiple items (Weinberg & Abramovitz, 2002) and the capability of testing the measurement characteristics of constructs (Hair & Black, 2010).

Hox and Bechger (1998) stated that a structural equation model implies a structure of the covariance matrix of the measures. Once the model's parameters have been estimated, the resulting model-implied covariance matrix can then be compared to an empirical or data-based covariance matrix. If the two matrices are consistent with one another, then the structural equation model can be considered a plausible explanation for relations between the measures. The SEM approach offers greater ability to handle multicollinearity, inherent errors in measuring independent variables and estimation of parameters (Hair & Black, 2010).

#### 4. Results

The questionnaire survey was aimed to gather data to investigate factors influencing electronic banking adoption showed in our research model. The Likert seven-point scale was used for the answer options. Only individuals were addressed within our survey. Over 600 potential individual clients from Slovakia were asked to fill in the questionnaire. In total, 211 filled out surveys were gathered, what represents approximately 35 percent return rate of questionnaires. There were 104 questionnaires returned (49.29%) from male respondents and 107 questionnaires (50.71%) from female respondents in our conducted survey. This ratio corresponds well to the demographic composition of the population in Slovakia. Two-thirds of respondents were younger than 40 years old. The biggest group of respondents (37.44%) was younger than 25 years old. Above 29% was between 25 and 40 years old and 24% between 41 and 55 years old. Over 55 years were only 19 respondents what represents 9% of respondents.

Following Tab. 1 contains all demographic characteristics of our survey respondents gathered.

Besides the demographic characteristics, Tab. 1 contains also electronic banking usage

**Tab. 1: Demographic characteristics of survey respondents**

Characteristic	Value	Frequency	Percentage
Sex	Male	104	49.29
	Female	107	50.71
Age	Less than 25 years	79	37.44
	Between 25 and 40 years	62	29.38
	Between 41 and 55 years	51	24.17
	Over 55 years	19	9.00
Electronic banking usage	Does not use	17	8.06
	Less than 1 year	20	9.48
	Between 1 and 3 years	80	37.91
	Over 3 years	94	44.55
Forms of e-banking used	None	17	8.06
	Internet banking	124	58.77
	Smart banking	1	0.47
	Both Smart banking and Internet banking	69	32.70
Frequency of usage per month	None	17	8.06
	1-2 payments	67	31.75
	3-4 payments	58	27.49
	5-6 payments	37	17.54
	More than 6 payments	32	15.17

Source: own

of respondents detected in our survey. Since the survey was aimed at general population in Slovakia, there was a possibility for the respondent to indicate that he or she does not use any form of electronic banking. We recorded 17 responses of respondents not using any form of electronic banking what represents approximately 8 percent.

The remaining 194 survey respondents using electronic banking will be used for verification of our research model. Twenty of our respondents (9.48%) have used electronic banking shorter than one year. Eighty respondents (37.91%) stated between one and three years of electronic banking usage and ninety-four respondents (44.55%) indicated over three years of usage.

Most of the respondents (124) were using internet banking what is over 58% of respondents. Only one user indicated using smart banking without using internet banking at the same time, while 69 users (32.70%) stated

that they use both smart banking and internet banking.

Further, the frequency of using electronic banking for payments was investigated. Over 31 percent of respondents (67) make 1 or 2 payments through electronic banking per month. Around 3 or 4 payments per month indicated 58 respondents what is 27.49 percent and 5 or 6 payments were stated by 37 respondents (17.54%). Approximately 15 percent of respondents use electronic banking intensively, i.e. more than 6 payments during the month.

Each of our proposed factors is represented by group of multiple questions or statements, presented in Tab. 2.

Cumulative percentage of variance explained represents increasing portion of variance explained by an inclusion of all previous factors stated in table. For further analysis of data, IBM SPSS Statistics software was used. Potential factors of perceived security, trust,

Tab. 2: Factor loadings

Item	Perceived security	Trust	Attitude toward using	Behavioral intention to use e-banking	Actual use of e-banking
I have enough information about secure use of electronic banking	.844				
I use electronic banking securely	.782				
Transferring sensitive information via electronic banking is secure	.903				
Overall, using electronic banking is secure	.851				
Electronic banking of my bank is trustworthy		.887			
I trust in electronic banking of my bank		.897			
Electronic banking keeps my best interests in mind		.845			
Using electronic banking is a good idea			.863		
Using electronic banking is convenient and pleasant			.900		
I consider electronic banking as suitable solution of covering my needs of banking services			.834		
I intend to continue using electronic banking in the future				.867	
I will recommend others to use electronic banking				.795	
I would always prefer e-banking				.767	
I am satisfied with advantages that electronic banking usage brings				.826	
I use electronic banking often					.849
I use electronic banking more frequently than classic banking					.822
I use electronic banking as main way of using banking services					.860
Percentage of variance explained	31.838	17.704	17.441	12.979	6.630
Cumulative percentage of variance explained	31.838	49.542	66.983	79.962	86.592

Source: own

attitude toward using and behavioral intention to use were investigated by confirmatory factor analysis. Specifically, principal axis factoring method with varimax rotation was used. This method is widely used in technology acceptance studies (e.g. Cheng et al. (2006), Yousafzai et al. (2009), Kumar et al. (2012) etc.). Foremost, Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were expressed. Bartlett's test of sphericity confirmed factorability since it was significant at a value of 0.000. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy with value at 0.958 confirmed that factor

analysis was appropriate because it surpassed required a minimum level of 0.60 for reliability (Kumar et al., 2012).

Cronbach's alpha serves as internal consistency reliability measure (Hair & Black, 2010). Cronbach's alpha test was performed to test the reliability of constructs as standard test of reliability of constructs (Kumar et al., 2012). Tab. 3 contains Cronbach's alphas of all constructs considered in our model. Minimum level for reliability is Cronbach's alpha at the value of 0.70 (Suh & Han, 2002; Hair & Black, 2010). Our first factor identified was perceived security with four variables and Cronbach's

**Tab. 3: Reliability of constructs**

Construct	Cronbach's Alpha
Perceived security	0.896
Trust	0.921
Attitude toward using	0.933
Behavioral intention to use	0.914
Actual use	0.859

Source: own

alpha at 0.896. The factor of trust had three variables with Cronbach's alpha at 0.921. The third factor of attitude towards using electronic banking contained three variables and had Cronbach's alpha value at 0.933. The fourth factor – behavioral intention to use electronic banking consisted of four variables with Cronbach's alpha of 0.914. The last factor is actual use of electronic banking and Cronbach's alpha at the level of 0.859.

The identified factors in Tab. 2 had eigenvalue above 1 and explained 86.59 percent of variable's variance in total.

We further used a Structural Equation Modelling (SEM) approach to validate the research model. This method was chosen for its ability to test relationships between constructs comprised from multiple items (research questions) (Weinberg & Abramovitz, 2002) and the capability of testing the measurement

characteristics of constructs (Hair & Black, 2010). The SEM approach offers several advantages over the conventional regression approach by providing greater facility in handling multicollinearity, inherent errors in measuring independent variables and estimation of parameters (Hair & Black, 2010). Also this method is widely used in studies on similar topic (e.g. Suh & Han (2002), Yousafzai et al. (2009), Nguyen et al. (2014)). AMOS extension of IBM SPSS Statistics software was used to perform further analysis. We used correlation matrix as input matrix to simplify interpretation of results. In the SEM approach, the validity of factors can be assessed by multiple fit indices. Tab. 4 shows overall fit indices of our research model.

All overall model fit indices surpassed the recommended values, therefore our research model has good representation of relationships between factors.

**Tab. 4: Overall model fit indices of our model**

	Score	Recommended value
Chi-square	43.015	
Degree of freedom	17	
Chi-square/degree of freedom	2.532	<3.00
Goodness-of-fit index (GFI)	0.827	>0.80
Adjusted goodness-of-fit index (AGFI)	0.894	>0.80
Root mean square residual (RMSR)	0.071	<0.08
Normed fit index (NFI)	0.924	>0.90
Non-normed fit index (NNFI)	0.922	>0.90
Comparative fit index (CFI)	0.951	>0.90

Source: own

Note: recommended values from Hair and Black (2010).

Tab. 5: Overall model fit indices of our model

Construct	Composite reliability	Variance extracted
Recommended value	>0.8	>0.5
Perceived security	0.864	0.680
Trust	0.937	0.861
Attitude toward using	0.901	0.769
Behavioral intention to use	0.879	0.793
Actual use	0.826	0.597

Source: own

Note: recommended values from Suh and Han (2002).

The validity of measurement can be assessed by composite reliability and the variance extracted measure. Composite reliability depicts the degree to which the items indicate the common construct. The variance extracted measure reflects the amount of variance in the items captured by the construct. Composite reliability and variance extracted by our research model constructs are presented at Tab. 5.

All composite reliabilities were above recommended value of 0.8 and all variance extracted measures were above recommended level of 0.5. This results demonstrate overall validity of constructs or factors used. Further we examined the estimated coefficients of the relationships between constructs, which would validate the hypotheses from our research model.

Firstly, hypothesis H1 examined the impact of perceived security on trust was investigated. It was observed that perceived security had a significant impact on trust in electronic banking ( $\beta = 0.793$ ,  $t = 11.224$ ,  $P < 0.01$ ). The model explained 72.4% of the variance in trust ( $R^2 = 0.724$ ). Our results support hypothesis H1, so perceived security has a significant positive impact on customer's trust in electronic banking.

Further, the relationship between perceived security and customer's attitude toward using electronic banking was expressed. Statistically significant ( $\beta = 0.453$ ,  $t = 8.957$ ,  $P < 0.01$ ) influence of security perceived by the customer on attitude toward using was detected. The results support hypothesis H2 stating that perceived security has a significant positive impact on customer's attitude toward using

electronic banking. Also, the influence of trust on attitude toward using was examined and found to be statistically significant ( $\beta = 0.357$ ,  $t = 5.742$ ,  $P < 0.01$ ). This result supported hypothesis H3 and thus customer's trust has significant positive impact on customer's attitude toward using electronic banking. These two factors explained 59.2% of the variance ( $R^2 = 0.592$ ) in attitude toward using electronic banking.

Further, the investigation of the impact of trust and attitude toward using electronic banking on customer's behavioral intention was conducted. The influence of trust on behavioral intention to use electronic banking was detected as significant ( $\beta = 0.471$ ,  $t = 7.867$ ,  $P < 0.01$ ). The impact of attitude toward using on behavioral intention to use electronic banking was also significant ( $\beta = 0.385$ ,  $t = 6.027$ ,  $P < 0.01$ ). These results support our hypotheses H4 and H5 and hence trust and attitude toward using electronic banking have significant positive influence on customer's behavioral intention to use electronic banking. These factors explained 63.7% of variance ( $R^2 = 0.637$ ) in customer's behavioral intention. Finally, the influence of customer's behavioral intention to use banking on its actual use was examined and it was found significant ( $\beta = 0.359$ ,  $t = 4.911$ ,  $P < 0.01$ ). The results support hypothesis H6 and customer's behavioral intention to use electronic banking has a significant positive impact on customer's actual use of electronic banking explaining 21% of variance ( $R^2 = 0.209$ ). Overview of impacts detected by model are summarized in following Tab. 6.

Our research model with relationships and values of coefficients displayed is presented

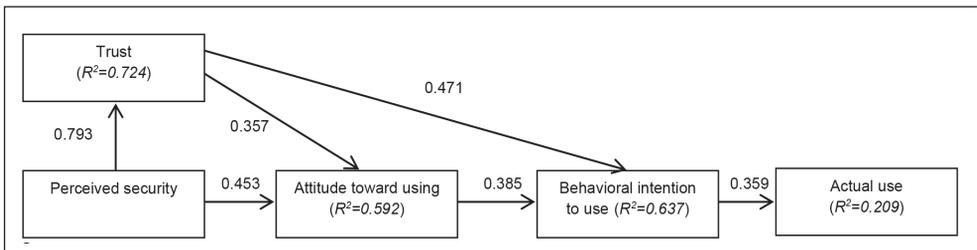
**Tab. 6: Influence between constructs detected by model**

Dependent construct	Independent construct	$\beta$	$t$	$P$
Trust	Perceived security	0.793*	11.224	0.000
Attitude toward using	Perceived security	0.453*	8.957	0.001
Attitude toward using	Trust	0.357*	5.742	0.002
Behavioral intention to use	Trust	0.471*	7.867	0.001
Behavioral intention to use	Attitude toward using	0.385*	6.027	0.001
Actual use	Behavioral intention to use	0.359*	4.911	0.003

Source: own

Note: \*Significant at  $\alpha = 0.01$ ;  $\beta$  – measures the prediction of the dependent construct from independent i.e. represents relation between constructs,  $t$ -value measures the size of the difference relative to the variation in sample data i.e. shows whether a coefficient is significantly different from zero.,  $P$ -value tests the null hypothesis that the coefficient is equal to zero i.e. probability that construct has no effect.

**Fig. 2: Structural model fit**



Source: own

**Tab. 7: Indirect and total effects on attitude, behavioral intention and actual use of e-banking**

Independent construct	Attitude toward using e-banking		Behavioral intention to use e-banking		Actual use of e-banking	
	Indirect	Total	Indirect	Total	Indirect	Total
Perceived security	0.184* (5.412)	0.453* (8.957)	0.201* (6.015)	0.201* (6.015)	0.091* (4.701)	0.091* (4.701)
Trust		0.357* (5.742)	0.179* (4.431)	0.471* (7.867)	0.134* (3.954)	0.134* (3.954)
Attitude toward using				0.385* (6.027)	0.095* (4.162)	0.095* (4.162)
Behavioral intention to use e-banking						0.359* (4.911)

Source: own

Note: \*significant at  $\alpha = 0.05$ .  $t$ -values are in parentheses

in the Fig. 2. The coefficients represent measure of detected influences between suggested factors from confirmatory factor analysis. The coefficients of determination ( $R^2$ ) for each endogenous construct are also shown in the figure.

Suh and Han (2002) in their study expressed indirect effect of trust on attitude toward using, behavioral intention to use and actual use of electronic banking. In our research, besides trust also perceived security and its effects on attitude toward using, behavioral intention to use and actual use were investigated. Our results show that both perceived security and trust have a significant effect on attitude toward using and behavioral intention to use which has direct effect on actual use and hence trust and perceived security have an indirect effect also on adoption of electronic banking. So additional step of SEM approach analysis was performed to identify indirect effects and total effects on attitude, behavioral intention and actual use of e-banking. Its results are illustrated in Tab. 7.

All factors had significant effects on attitude toward using, behavioral intention to use and actual use of electronic banking at  $\alpha = 0.05$ .

## Conclusions

In this study, we proposed research model based on adjusted TAM indicating a relationship between perceived security, trust, attitude toward using electronic banking and behavioral intention to use electronic banking. Perceived security was found a very important factor of trust building in the area of electronic banking and significant factor influencing attitude toward using it.

Trust was detected to have a significant influence on attitude toward using and behavioral intention to use electronic banking by customers. Further attitude toward using e-banking had a significant effect on behavioral intention to use electronic banking and subsequently the actual use of electronic banking by bank customers was significantly influenced by behavioral intention to use electronic banking by bank customers. These results correspond with results of multiple studies, e.g. Polatoglu and Ekin (2001), Black et al. (2002), Grabner-Kräuter and Faullant (2008) or Nguyen et al. (2014).

Security and trust have a significant effect on attitude toward using and behavioral intention to use according to our results and

therefore influence the process of adoption of electronic banking by customers. Suh and Han (2002) already showed that trust indirectly influences acceptance of electronic banking. Our research confirmed the influence of trust on electronic banking adoption. In addition, our study also included perceived security into research model and confirmed its influence on electronic banking adoption by potential users.

Our results suggest to the bank managers at Slovak retail banking market to build trust in electronic banking by increasing its security perceived by potential users. Banks should communicate every positive change in security standards of their electronic banking forms to improve confidence of clients when using it. This will promote adoption of electronic banking according to our results. Increased actual use of electronic banking might help to decrease labor consumption at brick-and-mortar branches of banks, while multiple time-consuming services (e.g. typing of bank transfers, creating account statements etc.) are advanced to clients themselves in electronic banking.

Furthermore, the novelty of our research is also in applying research of security and trust influencing electronic banking adoption in Slovakia, contributing to knowledge of conditions at Slovak retail banking market and customers. Our model might be used also in other fields of e-services (like e-commerce) adoption in both, Slovak and international conditions.

Our results are significant, but still have limitations of validity. The ideal representativeness of our sample was not achieved, affecting the generalization of results. A number of respondents in our sample (194) was also relatively lower than in multiple other studies (e.g. Nguyen et al. (2014), Suh and Han (2002) etc.) restricting the validity of our results.

Many studies using Technology Acceptance Model modified original TAM to investigate various factors affecting acceptance of given technology creating new versions of TAM. Also, our model can be further modified and extended by new factors to investigate their effects. Furthermore, our future research might be conducted in the sector of small and medium-sized enterprises.

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**Ing. Martinvejačka, PhD.**

Technical University of Košice  
Faculty of Economics  
Department of Applied Mathematics  
and Business Informatics  
martin.vejačka@tuke.sk

**Ing. Tomáš Štofa**

Technical University of Košice  
Faculty of Economics  
Department of Banking and Investment  
tomas.stofa@tuke.sk

## **INFLUENCE OF SECURITY AND TRUST ON ELECTRONIC BANKING ADOPTION IN SLOVAKIA**

**Martin Vejačka, Tomáš Štofa**

*Dynamical development of information and communication technologies has been one of the major factors of economic growth in recent decades. Electronic commerce allowed selling and buying of products or services to many times larger number of customers than ever before. Electronic banking as a part of electronic commerce is nowadays very important distribution channel for banking services. With the intense development of information and communication technologies also several forms of electronic banking arose and also vanished. Especially mobile banking recorded turbulent development in recent decades. Mobile banking in smart devices together with internet banking are now the main forms asserting in the electronic banking market. Competition among banks in the field of electronic banking pushes them to improve their electronic banking services to sustain or increase their market share. The important issue is trust of bank customers in the form of electronic banking used. Banks' customers also sensitively perceive security of electronic banking forms used by them.*

*In this article, we mainly investigated the influence of security and trust on electronic banking adoption. Research model based on technology acceptance model was developed and research hypotheses based on this research model were constructed. Data for hypotheses verification was gathered by online survey with 211 answering respondents. The influence of perceived security, trust, attitude toward using and behavioral intention to use electronic banking in Slovakia was examined using factor analysis. The results reveal that all factors investigated have statistically significant direct and indirect effects on electronic banking adoption by users on the Slovak retail banking market.*

**Key Words:** Trust, security, technology acceptance model, electronic banking, internet banking, mobile banking.

**JEL Classification:** G29, L86.

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