VOL. 10, NO. 23, DECEMBER 2015 ISSN 1819-6608
ARPN Journal of Engineering and Applied Sciences

www.arpnjournals.com

A MEASUREMENT MODEL OF RISK PERCEPTION IN INTERNET BANKING BASED ON MALAYSIAN CONTEXT

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ABSTRACT

Internet banking risks continue to intensify as accessibility to banking transactions around the world expands. Banks in Malaysia are faced with among the largest number of cyber-threats in the world. Considering these factors, the understanding of internet banking risks is important to enable banks to develop appropriate counter-measures. However, studies on internet banking in Malaysia have not examined risk factors in a comprehensive manner. Therefore, the purpose of this study was to test a measurement model for perceived risk in Internet banking using structural equation modeling analysis. This study extends the Technology Acceptance Model by incorporating seven risk constructs into the model to understand the impact of risks on intention to use internet banking in Malaysia. The survey method was used in the study and the data collection instruments were questionnaires, which were distributed through the drop-off and pick-up (DOPU) technique, to bank branch managers. The purposive sampling technique was employed to determine the respondents, individuals using Internet banking services in Peninsular Malaysia. A total of 413 questionnaires were analyzed using Structural Equation Modeling (SEM) with the Analysis of Moment Structures (AMOS) software. The results clearly indicate that perceived risk dimensions are strong determinants of intention to use internet banking. Furthermore, the seven dimensional measure of perceived risk is supported by acceptable fit indices. All dimensions showed modest but not high intercorrelations, as such, a second order measure of risk was ruled out. The distinctiveness of different risk measures were confirmed by the satisfactory discriminant validity assessment. This research draws together the key risk factors that need to be addressed by internet banking providers in Malaysia to ensure effective adoption and highlights the need to use risk as a multi-dimensional measure in future internet banking studies.

Keywords: measurement model, perceived risk, Internet banking, structural equation modelling, survey, validity, reliability

INTRODUCTION

Internet banking, also referred to as online banking or e-banking, involves the use of banking services by bank customers via the internet. Traditional banking practices have evolved into Internet banking which in recent years has been growing exponentially in many countries. The benefits offered by internet banking services include lowered operational costs, improved consumer banking services, retention of consumers as well as expansion of market share [32]. Therefore, Malaysia, with its robust banking environment, should see not only banking providers embracing IB rapidly but also customers being effectively convinced to convert to this form of banking service delivery.

The new banking environment sees IB managed as an operational activity and part of a multi-channel strategy [3]. This is especially so as a significant portion of operating costs can be reduced when customers are encouraged to use Internet banking (IB) services. Banks are pushed to offer IB services to remain competitive in the banking market, particularly as new players such as software and telephone companies could potentially enter the online banking market [7, 8].

Even so, IB adoption rates are not at the expected levels and are at different levels across countries even though there are anticipated benefits for banks and their customers [30]. Although the Internet has brought the information superhighway to our doorstep, its open environment means that online applications are exposed to security threats such as scams, phishing, and password-sniffing. The security factor has been found by existing literature to be the most important factor for IB technology adoption. Secondary data analysis has shown that the rate of IB expansion in Malaysia has been sluggish due to several factors. Adoption levels of IB in Malaysia have been found to be influenced by security, risk and trust factors [1, 11, 12, 14, 23, 24, 38].

Therefore, IB, being a mode of e-commerce and financial service, requires the development and implementation of a rigorous security system that can cope with constant expansion. [36] confirmed that electronic security adds value to an open network. An electronic security infrastructure consists of both soft (policies, processes, protocols and guidelines that protect the system and data) and hard (hardware and software needed to protect the system and data) structures. Such systems are crucial for effective risk management and consequently IB success [20]. The main determinant of IB service adoption is the customer's perception towards IB as strong psychological barriers to IB result in attitudes to IB that are prudential, resistant and limited [21]. Considering the importance of risk and the perceptions of customers, this study seeks to investigate risk perception towards IB services in Malaysia in order to understand specific risk factors that affect adoption of IB.

LITERATURE REVIEW

Many studies conducted in Malaysia and other countries, identify a growing trend of Internet banking adoption in Malaysia. Adoption of Internet banking in

Malaysia however is slowed due to security and personal preferences factors [33]. In Australia, the main obstacles to Internet banking adoption have been due to security concerns and Internet banking awareness [29]. Furthermore, the safety and security of transactions over the internet were the main concern of Internet banking customers in Australia.

In the context of Internet banking, trust has been suggested to be one of the obstacles that hinder individuals from adopting the technology [13]. Internet banking uses the Internet as its delivery platform and normally is associated with security issues. Online transactions involve sensitive information, and parties in the financial transactions are concerned about access to critical files and information transferred via the Internet [34]. The activities of hackers and the perceived unsafe nature of the Internet have been frequently highlighted in the mass media. Indirectly, this has further affected consumers‟ trust level of the Internet banking.

[37] Formulated and validated a model of trust in Internet banking among users in Malaysia and found that users in Penang were not sure that the factor was important to Internet banking practice. Meanwhile, [35] determined that a very important factor in Internet banking adoption was risk. [22] on the other hand found that raising public confidence for system utilization involved the speed; fees and charges) influencing e-banking adoption in Malaysia and found that security, privacy and convenience were significant contributors to e-banking acceptance.

[26] Identified the following six external variables that influence Internet banking adoption among Malaysian consumers namely, prior experience, training, perceived risk, awareness, cost and external pressure. The study highlighted the fact that the majority of respondents were not using Internet banking due to these factors. Another study by [27] found that there is a direct positive effect on the relationships between five factors (perceived ease of use, perceived usefulness, attitude, subjective norms and perceived behavioural control) and behavioural intention to use. This study revealed that the model that had the best explanatory power was the Theory of Planned Behaviour (TPB), followed by the Theory of Reasoned Action (TRA) and the Technology Acceptance Model (TAM) models. The study was among the unique studies in Malaysia with regards to Internet banking that compared the three models. Similarly, a later study confirmed that the TAM model had the best explanatory power, followed by the TPB and TRA models [28].

PERCEIVED RISK

Numerous researchers have recognized the importance of risk to understand trust [39]; however, at the same time, they have emphasized that the relationship between risk and trust is complex. Trust would not be needed if actions could be undertaken with complete certainty and without risk. The study by [18] imply that trust is a key variable that acts to reduce the perceived risk of using Internet banking. This element of risk is particularly pronounced in electronic commerce as opposed to traditional commerce. [39] has predominantly addressed the notion of perceived risk, which in the context of e-banking is defined here as “the potential of loss in the pursuit of a desired outcome from using electronic banking services”. However, the dimensions of perceived risk may vary according to the product (or service) class. Perceived risk in online banking is the subjectively determined expectation of loss by an online bank user in contemplating a particular online transaction [15].

In general, perceived risk is defined as the degree to which a user feels the uncertainty and adverse consequences of using an online application service in areas of financial risk, physical risk, functional risk, social risk, time-loss risk, opportunity cost risk, and information risk. If an unauthorized individual is able to get access to the online banking portfolio of a user, a considerable amount of financial information may be jeopardized and there might be considerable financial losses [6]. Hence, the most important categories of perceived risk associated with Internet banking are likely to be financial risk and security risk related to potential loss because of deficiencies in the operating system or misappropriation of funds through illegal external access [2, 16]. [10] Found that performance, time, security, financial and privacy risk act as mediators in the positive effect of Internet banking awareness on intention to use Internet banking.

The distant and impersonal nature of the online environment and the implicit uncertainty of using a global open infrastructure for transactions can bring about several risks. These risks are either caused by functional defects or security problems in information and communication technical systems (system dependent uncertainty) or are caused by the conduct of actors who are involved in the online transaction (transaction specific uncertainty). [40] agreed that risk can be perceived as a second order factor, comprising multiple first-order dimensions, such as performance risk, financial risk, time risk, psychological risk and social risk. This study was look into perceived risk as an additional belief variable, which is adopted from [15,17] and the model of e-trust banking [39] which is associated with the intention to continue using Internet banking.

In the context of electronic banking, when the bank can be trusted to show ability, benevolence, and integrity there is much less risk involved in interacting with the bank. Moreover, a trusted bank can be expected to take steps toward the development of institution-based trust associated with the Internet infrastructure and reducing the environmental risk associated with the Internet infrastructure and reducing the environmental risk associated with a focal transaction. In general, trust improves the customer’s belief towards electronic banking and the associated infrastructure, thus reducing the perceived level of risk associated with the transaction process. The measures were all adapted from published literature (see Table-1).

Table-1. Questionnaire items used in this study.

Constructs	Questionnaire items	Source
Physical Risk	Using the Internet Banking would not prevent loss of data or damage to the hard disk. Using the Internet Banking will cause me headache. Using the Internet Banking, my eyesight will be affected (eg. Get sore eyes). Using the Internet banking is strain for hand.	[17]
Functional Risk	The security systems built into the Internet Banking are not strong enough to protect my checking account Internet banking servers may not perform well and process payments incorrectly. Internet banking servers may not perform well because of slow download speeds, the servers' being down or because the web site is undergoing maintenance. Considering the expected level of service performance of the Internet Banking for you to sign up for and use it would be.	[4,15]
Social Risk	When my bank account incurs fraud or the hacker invades, I will have potential loss of status in one's social group. I'm sure that if I decided to use Internet banking and something went wrong with online transactions, my friends, family and colleagues would think less of me. I believe that people (friends, family, & colleagues) who influence my behavior think that I must use Internet banking. I believe that people (friends, family, & colleagues) who are important to me, strongly support the use of Internet banking.	[4,40]
Time Loss Risk	If you had begun to use an Internet Banking, what are the chances that you will lose time due to having to switch to a different payment method? My signing up for and using an Internet Banking would lead to a loss of convenience on me because I would have to waste a lot of time fixing payment errors. Considering the investment of my time involved to switch to (and set up) an Internet Banking makes them risky. The possible time loss from having to set-up and learn how to use Internet banking bill payment makes them risky.	[4]
Financial Risk	Using an Internet banking service subjects your checking account to potential fraud. Using an Internet banking service subjects your checking account to financial risk. What are the chances that you stand to lose money if you use the Internet Banking? My signing up for and using an Internet Banking would lead to a financial loss for me.	[4]
Opportunity Cost Risk	It would be an alternative to using the traditional Banking. There is a high probability of losing money by using Internet Banking services. There is great uncertainty associated with Internet Banking services. Overall, I would label the option of using Internet Banking services as	[17,19]

	something negative. I believe that the risk of using Internet Banking services is very high.	
Information Risk	I believe my Internet banking transaction information will only be used for the purpose of the original transaction. While using Internet banking, I believe that I control the use of my information. I believe my Internet banking transaction information will not be lost during an online session. I believe my Internet banking transaction information will only reach the target bank account.	[40]

METHODOLOGY

The population used in this research comprise of represented by Internet banking users in Peninsular Malaysia, who use local and foreign Internet banking services. This research utilized the purposive sampling method as respondents are confined to a specific type of person who can provide the desired information [31], which in this case are Internet banking users. The judgement sampling type was found to be the most suitable for the sample design because of the limited number or categories of people that have the information that is sought (only Internet banking users experience the phenomenon). Data collection for this research was through the use of self-administered questionnaires that were administered using the drop-off and pick-up (DOPU) technique. The questionnaires were distributed to the respective bank branch managers who were willing to distribute them to their customers. A total of 452 respondents returned the questionnaires while only 413 respondents completed the questionnaires.

ASSESSING VALIDITY AND RELIABILITY OF THE MEASUREMENT ITEMS

To assess the validity and reliability of the items we ran a confirmatory factor analysis using AMOS version 22 and the results are summarized in Table-2. Researchers usually assess the convergent and discriminant validity of the measures. As proposed by [9] convergent validity can be determined by looking at the loadings, average variance extracted (AVE) and composite reliability (CR). The discriminant validity can be determined by using the [5] criteria. Figure 1 is graphical presentation of how we tested the measurement as we tested first order. If second order we will have an overall variable risk.

As shown in Table-2 all the loadings were greater than 0.6, the AVE were higher than 0.5 and the CR were all more than 0.7 indicating sufficient validity and reliability. It was also suggested that satisfactory discriminant validity is established when the AVE of a particular construct is greater than the correlation shared by that particular construct with other constructs in the model [5]. A study by [25] asserted that convergent discriminant is established when the diagonal elements (square root of the variance extracted) are greater than the off-diagonal elements (correlations among the constructs) (see Table 3). As such we can conclude that the construct validity of the scale is good.

For a good model fit, the Chi-square normalized by degrees of freedom (χ^2/df) should not exceed 3, goodness of fit index (GFI) should exceed 0.9, adjusted goodness of fit index (AGFI) should exceed 0.8, non-normed fit index (NNFI) should exceed 0.9, comparative fit index (CFI) should exceed 0.9 and root mean squared error (RMSEA) should not exceed 0.08. As shown in Table 4 the fit indices assessed such as χ^2/df was 2.906, GFI = 0.911, AGFI = 0.873, CFI = 0.953, TLI = 0.940 and RMSEA = 0.068 which suggest adequate model fit.

Table-2. Measurement model.

Construct	Item	Loadings	AVE[a]	CR[b]
Financial Risk	FIR1	0.944	0.754	0.900
	FIR2	0.964		
	FIR3	0.664		
Functional Risk	FUR1	0.873	0.638	0777
	FUR3	0.717		
Information Risk	IR1	0.806	0.562	0.834
	IR2	0.872		
	IR3	0.674		
	IR4	0.618		
Opportunity Cost Risk	OCR2	0.883	0.710	0.880
	OCR3	0.819		
	OCR5	0.824		
Physical Risk	PHR2	0.860	0.836	0.939
	PHR3	0.931		
	PHR4	0.950		
Social Risk	SR1	0.762	0.607	0.755
	SR2	0.796		
Time Loss Risk	TLR2	0.716	0.780	0.913
	TLR3	0.955		
	TLR4	0.957		

Note: FIR4, FUR2, FUR4, OCR1, OCR4, PHR1, SR3, SR4 and TLR1 were deleted due to low loadings.
a Average variance extracted (AVE) = (summation of the square of the factor loadings)/{(summation of the square of the factor loadings) + (summation of the error variances)}.

b Composite reliability (CR) = (square of the summation of the factor loadings)/{(square of the summation of the factor loadings) + (square of the summation of the error variances)}.

Table-3. Discriminant validity of construct.

Construct	1	2	3	4	5	6	7
OCR	0.843						
IR	0.105	0.750					
FIR	0.691	0.123	0.868				
TLR	0.666	0.048	0.581	0.883			
SR	0.682	0.111	0.566	0.765	0.779		
FUR	0.610	0.046	0.561	0.597	0.648	0.799	
PHR	0.609	0.095	0.406	0.630	0.601	0.534	0.914

Note: Values on the diagonal are the square root of the AVE while the off-diagonals are correlations

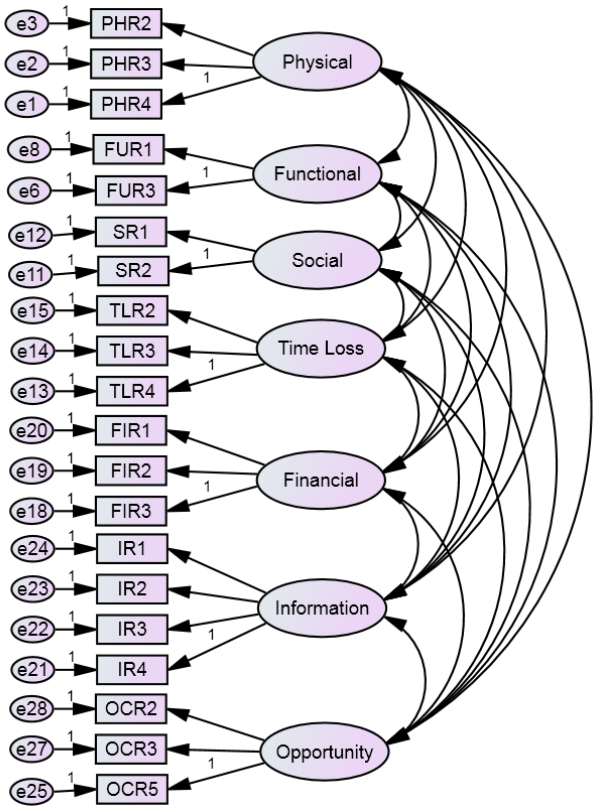

Figure-1. Final measurement model.

Table-4. Fit Indices.

Criterion	Recommended	This study
$\chi 2/df$	≤ 3	2.906
GFI	≥ 0.90	0.911
AGFI	≥ 0.80	0.873
CFI	≥ 0.90	0.94
TLI	≥ 0.90	0.953
RMSEA	≤ 0.08	0.068

CONCLUSIONS, IMPLICATIONS AND LIMITATIONS

Empirical examinations of multi-dimensional constructs have lacked consistency even though numerous research articles on information systems have used such constructs in recent years. Likewise, this research has tested a multi-dimensional measurement model of risk perception in Internet banking but attempts to examine the characteristics of risk in a structured manner. The findings clearly show that physical risk, functional risk, social risk, time loss risk, financial risk, opportunity cost risk and information risk analysis are supported with acceptable fit indices.

Theoretical contributions of this study was extended perceived risk is an additional belief variable which was adapted from [15] and Model of e-trust banking by [39]. This research may help to enhance and deepen understanding of this theory by applying it to Internet banking. This study also may add to literature by providing in-depth understanding of the characteristics of perceived risk and their influence on Internet banking usage by looking at multi-dimensional construct of risks (such as physical risk, functional risk, social risk, time loss risk, financial risk, opportunity cost risk, and information risk).

Considerable interest has been devoted to methodological research in the identification and treatment of heterogeneous data structures within a CB-SEM framework. Besides, basic CB-SEM analyses, research can also take advantage of a much larger set of methodological extensions when using the CB-SEM method, ranging from evaluation techniques.

Practical implications arise based on the results of this study. To assist banking institutions in Malaysia to reduce customer risk when using online banking services, we need to consider and test risk dimension in Internet banking. Such research holds the promise of enabling banking institutions to develop good marketing strategies that will promote online banking applications in the future. It is hoped that this article will encourage future researchers to contemplate risk as a measure that is a multi-dimensional construct, especially as the paper has shown the possibility of incorporating multi-dimensional constructs in covariance-based or component-based analysis.

By investigating each of the risk dimensions that influence the intention to continue using Internet banking may help to improve the overall perception of the risk. Past studies have shown that perceived risk were

investigated as general risk which is not multi-dimensional constructs. It would be interesting to understand which facets of risk are more significant to intention to continue using Internet banking. Different types of transactions deal by the Internet banking customers would emphasize different risk facets when using Internet banking services.

One of the main limitations of this study is that only Internet banking customers from Peninsular Malaysia were used as respondents for testing the model. Thus, the generalization of the findings of this study to the overall population of Internet banking users in Malaysia is limited. In addition, the profiles of respondents (Internet banking customers in the respective bank branches) were private as the management of the banks could not disclose sensitive information. As such, the researchers were not able to determine the number of Internet banking customers in each bank. Furthermore, generalizations cannot be made conclusively due to unidentified factors even though the study had an acceptable response rate.

ACKNOWLEDGEMENTS

The authors acknowledge all reviewers for their comments on this manuscript and are grateful to the committee members of the 4th International Conference on Research and Innovation in Information Systems for organizing a beneficial conference that provided a good platform for research. This article is supported by the USM Short Term Grant (no: 304/PMGT/6313098).

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