

# The role of UTAUT, DOI, perceived technology security and game elements in internet banking adoption

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## Abstract

**Purpose** – The increasing innovation and urgent need of up-to-date and convenient information systems have gained high importance in financial sector. Several banks have deployed internet banking in order to reduce cost while improving customer services. Therefore, the growth of internet banking is limited and in many cases fallen short of expectations. The purpose of this paper is to develop an integrated model that combines technology, innovative and environmental factors altogether in order to understand customer's intention to adopt, and intention to recommend internet banking in social networks.

**Design/methodology/approach** – In all, 398 valid responses were collected from customers of commercial banks, using convenience sampling approach. Data were analyzed using the structural equation modeling.

**Findings** – The findings show that integrated model has good explanatory power (78.3 percent) to predict customer's intention to adopt internet banking. Findings also revealed that the interaction effect of gamification between user's intention to adopt and user's intention to recommend internet banking will be stronger when gamification effect is higher. Importance performance matrix analysis (IPMA) revealed that innovativeness and perceived technology security were the most important factors in order to determine user's intention with regard to adoption of internet banking.

**Practical implications** – For policy-makers, it is suggested that they should focus on innovative characteristics and must ensure the possible environment for carrying out internet banking transaction. Advertising about new technology with adequate information may produce positive influence on user's intention. Enjoyable internet banking website with reward system will help to improve user's intention to adopt and intention to recommend internet banking with others, thus developers should introduce game features on internet banking website.

**Originality/value** – This study provides basis for further refinement of individual technology acceptance models and enrich the e-commerce literature adding innovative and game elements in internet banking adoption context. Additionally, the proposed model makes an important contribution in emerging e-commerce literature especially in the context of innovative and gamified internet banking.

**Keywords** UTAUT, Gamification, Structural equation modeling (SEM), Diffusion of innovation, Intention to recommend, Perceived technology security

**Paper type** Research paper

## 1. Introduction

Technology acceptance research is constantly growing and new technologies evolving all the time (Jin *et al.*, 2015). The evolution of new technologies provides a chance to organization to retain customers and offer them new services and products (Martins *et al.*, 2014). The banking sector is using technology not only for internal operation, but also to provide convenient services to customers. Despite the potential benefits that internet banking offers to consumers, the adoption of internet banking has been limited and, in many cases fallen short of expectations (Alwan and Al-Zubi, 2016; Lee, 2009; Rahi, Ghani, Alnaser and Ngah, 2018). There are still a large group of customers who refuse to adopt internet banking services due to uncertainty and security concerns (Lee, 2009; Martins *et al.*, 2014; Samar, Ghani and Alnaser, 2017). Globally, it is forecasted that the growth of internet banking users is expected to be moderate



until 2018 (eMarketer, 2014). Thus, a careful review is required to understand the main determinants of internet banking adoption for banks and users.

Earlier research has focused on either customer's intention or actual use of internet banking. Author's like Wang *et al.* (2017), extended the unified theory of acceptance and use of technology (UTAUT) model (PE and EE) with compatibility and personalization, revealed that compatibility significantly moderate the relationship between personalization and performance expectancy. The extended UTAUT2 model was tested by Tarhini *et al.* (2016), to understand the Lebanonies customer's intention with regards to adoption of internet banking. However, these studies have failed to provide theoretical contribution as model studied without adding external variables.

According to Martins *et al.* (2014), there is limited empirical work which simultaneously captures technology and risk factors to understand user's behavioral intention with regards to internet banking adoption. The contribution of our research is in twofold: First, we extended the UTAUT model with diffusion of innovation (DOI) and perceived technology security. Second, our study focuses on gamification effect on user's intention to adopt and intention to recommend internet banking. Miltgen *et al.* (2013), argued that due to overwhelming emphasis on user's behavioral intention, a post-adoption behavior (i.e. intention to recommend technology) has been ignored. Therefore, the current research expands the scope of adoption studies and develop an innovative integrated model which is based on technology factors (performance expectancy, effort expectancy) innovative factors (innovativeness, compatibility), and environmental factors (intention to recommend internet banking in social networks). This study may help banks to develop right policies and actions to derive customer's intention toward adoption of internet banking.

## 2. Literature review

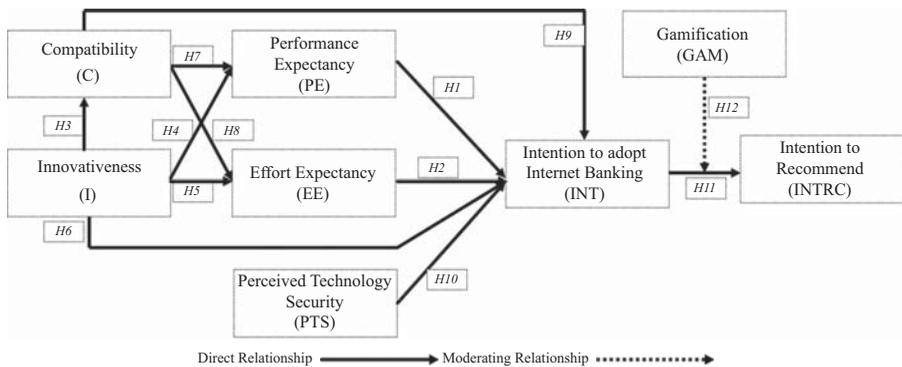
Rahi, Ghani, Alnaser and Ngah (2018) summarize the concept of internet banking as "banking channel that allows consumers to do a wide range of financial and non-finical service through a bank website." internet banking service provides an opportunity to customers to manage and control their financial accounts and transaction through bank website. Banks are distinguishing due to innovative services and active internet strategies, this in turn create competitive pressure. Wong *et al.* (2009) stated that, advances in information technology has stimulated the development of internet banking. In past few decades the relationship between internet banking and users has changed due to technology evolution (Rodrigues *et al.*, 2017). It is estimated that globally, 423.5m people accessed internet banking which is only 28.7 percent of internet users (Statista, 2012). In developing country context like Pakistan the growth of internet banking is stagnant (Rahi, 2016; Rahi and Ghani, 2016). A report issued by State Bank of Pakistan (2015), depicted 3 percent growth as compare to previous fiscal year. Additionally, it is forecasted that the growth of internet banking users is expected to be moderate until 2018 (eMarketer, 2014).

In spite of technological investment in internet banking application, the use of internet banking service remains modest (Devi Juwaheer *et al.*, 2012; Rodrigues *et al.*, 2017). There is still a large group of customers who have refused to adopt internet banking due to uncertainty and security issues (Martins *et al.*, 2014; Rahi, 2015; Samar, Ghani and Alnaser, 2017). Thus, understanding the main determinant of internet banking adoption is important both for banks and users. To deepen the understanding, we developed an integrated model grounded in UTAUT, DOI, perceived technology security and game elements as shown in Figure 1.

### 2.1 Unified theory of acceptance and use of technology (UTAUT)

The unified theory acceptance and use of technology was introduced by Venkatesh, Morris, Davis, and Davis (2003) and served as the overarching theoretical model in this study. Several model have been evolved in IS literature that sought to investigate user's beliefs, attitude and

**Figure 1.**  
The proposed  
research model



intention at individual level (e.g. theory of reasoned action by Fishbein and Ajzen (1975), theory of planned behavior by Ajzen (1991) and technology acceptance model by Davis *et al.* (1989). Therefore, Venkatesh *et al.* (2003) stated that previous theories were simple and individual-oriented. In addition to that most of the studies were conducted in voluntary contexts that might be not suitable for mandatory context. Thus, Venkatesh *et al.* (2003) provide a comprehensive model which can explain 70 percent of the variance in user's intention.

Since its inception in 2003, UTAUT model has been a subject of much research in information system related studies, therefore in developing country context the integration of UTAUT model has not been examined yet especially in the context of internet banking adoption. Previously, UTAUT model was extended by Wang and Yang (2005), in online stock and financial market by adding personality traits construct. The constructs of personality traits were incorporated in two ways with UTAUT as indirect and moderator relationship. The result revealed that the variance explained in indirect or intervention was low as compare to moderating effect which was 60 percent. The model concluded that moderating effect of personality traits was more important than external variables. One another study conducted by Carlsson *et al.* (2006) has investigated mobile adoption services with UTAUT framework. The results revealed that performance expectancy and effort expectancy significantly influence on intention of mobile usage. Therefore, with attitude the effect was noted weak which reflect that attitude explains part of the intentions to use mobile devices. Meanwhile, the effect of facilitation condition on intention of mobile usage was insignificant. Therefore, Wang *et al.* (2017) stated that performance expectancy and effort expectancy are the prominent factors to investigate users' intention. Wang *et al.* (2017) extended the UTAUT model with personalization and compatibility to investigate Chinese user's behavior toward adoption of internet banking. Thus, from UTAUT model we included two derivers performance expectancy and effort expectancy which is in line with previous study conducted by Wang *et al.* (2017).

Performance expectancy measures "the degree where an individual believes that using the system will help him/her to attain gains in job performance" (Venkatesh *et al.*, 2003). In internet banking context, the degree where an individual believes that using internet banking will help him/her to attain gains in performing banking tasks (Wang *et al.*, 2017). Alalwan *et al.* (2014) views suggest that performance expectancy is considered as term of utility that encounter during use of internet banking. Past studies confirmed that performance expectancy influence on user's intention to adopt internet banking (Al-Qeisi *et al.*, 2014; Martins *et al.*, 2014; Wang *et al.*, 2017). Thus, we feel confident theorizing a causal link between performance expectancy and customer's intention to adopt internet banking:

*H1.* Performance expectancy has positive influence on customer's intention to adopt internet banking.

Effort expectancy, measure “the degree of ease associated with consumers use of technology” (Viswanath *et al.*, 2012). According to Miltgen *et al.* (2013), effort expectancy contributes to a precise prediction of intention to adopt a new technology. Individual who believes that online banking is effortless likely to adopt it (Albugami and Bellaaj, 2014; Chaouali *et al.*, 2016). Studies have shown significant influence effort expectancy on user’s intention to adopt internet banking (Martins *et al.*, 2014; Riffai *et al.*, 2012). Therefore, we derive the following hypothesis:

*H2.* Effort Expectancy has positive influence on customer’s intention to adopt internet banking.

## 2.2 Diffusion of innovation

The early formulation of diffusion paradigm was originated by study work of Ryan and Gross (1943). Later, in 1962, Roger proposed four elements of diffusion include: innovation, communication channel, time and social system in his book entitled DOI. Diffusion occurs through a series of communication channels over a period of time among the member of social system. Rogers (2003) proposed five stages of adoption process which include: knowledge, persuasion, decision, implementation and confirmation. Knowledge is defined as where the individual is exposed to an innovation’s existence and gains an understanding that how it function. Hence, persuasion is explained where the individual forms a favorable attitude toward the innovation. Rogers (2003) stated that individuals at this stage become psychological involved and they seek information from their peers about the innovation. Third stage of adoption process is decision. It was defined a situation when an individual engages in activities that lead to selection either to adopt or reject an innovation. The fourth stage of adoption process is implementation a condition where individual puts an innovation into use. Finally, the fifth stage is confirmation where individual seeks reinforcement for an innovation-decision that already made but may be reverse the decision if exposed to conflicting messages about it.

Rogers (2003) explains that, diffusion is a process where an innovation is communicated through certain channels among members of social system while an innovation is an idea or practice that is perceived as new by an individual. Personal innovativeness is defined as defined by Mun *et al.* (2006) “the willingness of an individual to try out any new IT, plays an important role in determining the outcomes of user’s acceptance of technology.” According to Zhao and de Pablos (2011), personal innovativeness is an important variable in determining outcome of technology adoption. Previously, innovativeness has shown significant impact on user’s intention to adopt new technology (Mun *et al.*, 2006). Innovativeness has not only direct influence on user’s behavior to adopt technology, but it is found having significant influence on performance expectancy, effort expectancy and compatibility (Oliveira *et al.*, 2016). Thus, innovativeness is hypothesized as:

*H3.* Innovativeness has positive influence on compatibility.

*H4.* Innovativeness has positive influence on performance expectancy.

*H5.* Innovativeness has positive influence on effort expectancy.

*H6.* Innovativeness has positive influence on customer’s intention to adopt internet banking.

Rogers (1962) introduced the world compatibility “as the degree to which an innovation is perceived as being consistent with existing values, current working practices/needs, and past experiences of potential adopters.” Compatibility assessed the extent of congruence between new technology and the situation in which it is being utilized (Karahanna *et al.*, 2006). Studies on innovation diffusion have shown that compatibility is another important

variable in determining new technology (Kuo and Yen, 2009; Miltgen *et al.*, 2013; Oliveira *et al.*, 2016). As Miltgen *et al.* (2013) recognized, computability directly influence on perceived usefulness, perceived ease of use and behavioral intention to adopt. Similarly, Kuo and Yen (2009) acknowledge that compatibility not only had strong direct effect on user's behavioral intention, but also found an important antecedent of performance expectancy and effort expectancy. Compatibility has shown direct influence on user's intention, performance expectancy and effort expectancy (Oliveira *et al.*, 2016). Therefore, compatibility is hypothesized as:

H7. Compatibility has positive influence on performance expectancy.

H8. Compatibility has positive influence on effort expectancy.

H9. Compatibility has positive influence on customer's intention to adopt internet banking.

### 2.3 Perceived technology security

Security concern has been viewed as a major barrier in e-commerce adoption (Salisbury *et al.*, 2001). Author's like Rahi, Ghani and Ngah (2018) defined perceived technology security as "the buyer's perception about a seller's inability and unwillingness to protect monetary information." According to Salisbury *et al.* (2001) stated that it is important to have secure feeling during financial transaction. Websites where monetary information is managed, security concern becomes an inhibitor to adopt new technology (Cheng *et al.*, 2006). According to Rahi, Ghani and Ngah (2018), explained, information security is found major barrier in internet banking adoption. Studies have shown that perceived technology security has positive influence on user's intention to adopt internet banking (Cheng *et al.*, 2006; Oliveira *et al.*, 2016; Rahi, Ghani, Alnaser and Ngah, 2018). Therefore, perceived technology security is hypothesized as:

H10. Perceived technology security has positive influence on customer's intention to adopt internet banking.

### 2.4 User's intention to recommend internet banking technology

Earlier studies have examined that consumers with a higher intention to accept technology are much more likely to become adopters of the technology and recommend the technology to others (Kuo and Yen, 2009; Lee *et al.*, 2011). Similarly, Leong *et al.* (2013), stated that user's with high intention to adopt technology can influence the intention to recommend the technology to their social networks. As suggested by Zhang *et al.* (2015), social networks is vital mean of communication that allows customers to express their opinion and experience about new products or technology and bringing challenges and opportunities to companies. In financial services context, past studies confirmed that user's having high intention will influence on user's intention to recommend it to others (Oliveira *et al.*, 2016; Rahi, Ghani and Ngah, 2018). Therefore, we feel confident theorizing a causal link between user's intention to adopt internet banking and user's intention to recommend internet technology to others:

H11. User's intention to adopt internet banking has positive influence on customer's intention to recommend internet banking.

### 2.5 Gamification in non-game context

The concept of gamification mechanics in non-game context has been identified fast emerging practice in business. The use of gamification tools has potential benefit for

organization and individual because of their influence on user's behavior. According to Baptista and Oliveira (2017) gamification is defined as the use of game mechanics and game design techniques in non-game context to engage people. Gamification is perceived as a system applying game design elements to a non-game context to change people's behaviors. In this study we defined gamification as information, game characteristics and processes, to engage and motivate customers to use internet banking website. The game elements includes webpages navigation, content personalization, search tool, interactivity and graphic color design and these elements should be viewed as a set of website design in order to influence on user's behavior to use and stay on the website (Hamari and Lehdonvirta, 2010).

According to Rodrigues *et al.* (2017), interaction with website using game elements will help user's to find data information in more easy and pleasant way, and this will influence on user's intention to adopt internet banking. Game elements can be viewed as an attempt to convert utilitarian services into more hedonically oriented (Hamari and Lehdonvirta, 2010). Game elements on website can produce positive emotion, sense of accomplishment and strong social relationship (Hung *et al.*, 2015). It is argued having gamification features on banking website make banking activities more exciting, interesting and enjoyable (Baptista and Oliveira, 2017). Past studies have indicated that game elements positively influence on user's intention to adopt internet banking (Baptista and Oliveira, 2017; Rodrigues *et al.*, 2017). We therefore, hypothesized that:

- H12.* The positive relationship between customer's intention to adopt and customer's intention to recommend will be stronger when gamification is higher.

### 3. Research methods

#### 3.1 Measurement instruments

To test the theoretical model, a survey was conducted in Pakistan. A questionnaire was developed for the survey using constructs and items. All measurement instruments were adapted from the literature, with a slight modification. Performance expectancy, effort expectancy and intention to adopt were adopted from Rahi, Ghani and Ngah (2018), compatibility from Moore and Benbasat (1991); innovativeness from Mun *et al.* (2006); perceived technology security and intention to recommend from Rahi, Ghani and Ngah (2018), gamification from Rodrigues *et al.* (2017). To test the reliability of the instrument pilot test was conducted with a sample of 100 subjects in August 2017. The results confirm that instrument was valid and reliable. In order to avoid skewing in results, the data from pilot test was not added in the second phase of data collection. Each item of the questionnaire was measured on a seven-point likert scales ranging from 1 (strongly disagree) to 7 (strongly agree). Additionally, demographic variables (age, gender, and qualification) were also included.

#### 3.2 Data collection

The survey was administered toward customers of commercial banks in Pakistan. We first required the permission of commercial banks (HBL and ABL) situated in three large cities of Pakistan (Lahore, Islamabad and Shakargarh) to express our need for the information research purpose. After that, we distributed internet banking survey questionnaire among customers of commercial banks. The respondents engaged in this study were sampled by convenience sampling as suggested by Rahi (2017a, b) and Rowley (2014). According to, Rowley (2014), when the aim of research is to test the veracity of the proposed theoretical effects, the use of convenience sampling may suffice.

Respondents were free to participate at their own discretion. The survey was conducted over the period of one month from 9 September 2017 to 10 October 2017. The total number of questionnaires distributed was 750, in five banks in which 415 returned with a response rate of 55 percent. Among the 415 responses, 17 were discarded based on two criteria: the respondents did not fill all the questions and the questionnaire contained non-serious answers (Rowley, 2014). Thus, finally 398 valid questionnaires with a response rate of 53 percent were used for further data analysis.

### 3.3 Common method bias

In order to test non-response bias, Harman's single factor test was incorporated as suggested by Podsakoff *et al.* (2003). Common method bias is problematic if single latent factor would carry the majority of the variance explained (Podsakoff *et al.*, 2003). Therefore, no significant common method bias was found in our data set. The maximum co-variance explained by single factor was only 29.62 percent which was less than 50 percent indicating that common method bias is not a likely issue in this study (Podsakoff *et al.*, 2006; Rahi, 2018).

### 3.4 Sample profile

Concerning with demographic data 41 percent of the respondents were male and 59 percent were female. The majority of the participants were young with age of 21–30 years ( $n = 153$ , 38.4 percent) while the respondents who had age less than 20 years were at lowest numbers ( $n = 34$ , 8.5). Respondents were asked that how long they have been used the internet banking services. Results indicated that, the highest number of respondents were those who had used internet banking facilities from more than two years ( $n=233$ , 58.5 percent), These findings showed that most of the respondents were active internet banking users as they were using internet banking from more than two years. Finally, education levels of the respondents were 49 percent graduated and 30 percent post graduate.

## 4. Data analysis and results

To analyze the research model, we employed the partial least squares (PLS) analysis technique using the SmartPLS 3.0 software (Ringle *et al.*, 2015). PLS is a variance-based structural equation modeling and suitable for this study as the purpose of this study is to predict user's intention with the integration of UTAUT and DOI instead of testing (Hair *et al.*, 2013). We followed the two-step procedure suggested by (Anderson and Gerbing, 1988). First, we tested the measurement model (validity and reliability of the measure) followed by an examination of the structural model (testing the hypothesized relationships). To test the significance of the path coefficients, a bootstrapping method was used (Hair *et al.*, 2014).

### 4.1 Measurement model

To test the measurement model two types of validity were examined the first convergent validity and second discriminant validity. The convergent validity include indicator loading, composite reliability (CR) and average variance extracted (AVE) (Rahi, 2017b). Whereas, discriminant validity is the degree where items differentiate among constructs and measures distinct concepts Fornell and Larcker (1981). According to Chin (1998), if factor loading values are above than 0.6, this confirmed that convergent validity of the constructs is achieved. The convergent validity was also confirmed through estimation of AVE as recommended by Fornell and Larcker (1981), AVE values must be greater than 0.5. Finally, convergent validity is assessed through CR, degree where the construct indicators

represent the latent construct, values must be greater than 0.7 as recommended by Hair *et al* (2014). Table I depicted the results of measurement model.

Discriminant validity of the constructs was evaluated using Fornell and Larcker (1981) criterion. Fornell and Larcker (1981) indicate that the average variance shared between each construct and its measure should be greater than the variance shared between the constructs and other constructs. The square root of the AVE (as presented in bold values on the diagonals) was greater than the corresponding row and column values that confirmed the measure is discriminant (see Table II).

As depicted in Table II, the construct reliability, convergent validity, and discriminant validity of the constructs are satisfactory. Thus, instrument can be used to test the structural model.

Constructs/items	Loadings	$\alpha$	CR	AVE
<i>Compatibility (C)</i>				
C1: Using internet banking is compatible with all aspects of my life style	0.912	0.890	0.923	0.750
C2: Using internet banking is completely compatible with my current situation	0.838			
C3: I think that using internet banking fits well with the way I like to use	0.941			
C4: Using internet banking fits into my life style	0.762			
<i>Effort expectancy (EE)</i>				
EE1: My interaction with internet banking would be clear and understandable	0.801	0.920	0.944	0.809
EE2: It would be easy for me to become skillful by using internet banking	0.956			
EE3: I would find internet banking easy to use	0.936			
EE4: I think that learning to operate internet banking would be easy for me	0.898			
<i>Gamification (GAM)</i>				
GAM1: I think a banking website with content and animated elements is secure	0.803	0.775	0.863	0.679
GAM2: I feel pleasure in the use of a website with game elements and mechanics	0.928			
GAM3: The bank websites should reward their customers through a system by points	0.729			
<i>Innovativeness (I)</i>				
I1: If I heard about a new information technology, I would look for ways to experiment with it	0.827	0.853	0.911	0.774
I2: Among my peers, I am usually the first to try out new information technologies	0.900			
I3: I like to experiment with new information technologies	0.909			
<i>Intention to adopt (INT)</i>				
INT1: I intend to use internet banking in the next months	0.853	0.856	0.912	0.776
INT2: I predict I would use internet banking in the next months	0.894			
INT3: I plan to use internet banking in the next months	0.896			
<i>Intention to recommend (INTRC)</i>				
INTRC1: I will recommend to my friends to use the internet banking service	0.938	0.894	0.934	0.825
INTRC2: If I have a good experience with internet banking I will recommend friends to subscribe the service	0.879			
INTRC3: I will definitely recommend to my friends to use the internet banking service	0.907			
<i>Performance expectancy (PE)</i>				
PE1: Internet banking is useful to carry out my tasks	0.793	0.802	0.871	0.628
PE2: I think that using internet banking would enable me to conduct tasks more quickly	0.765			
PE3: I think that using internet banking would increase my productivity	0.821			
PE4: I think that using internet banking would improve my performance	0.789			
<i>Perceived technology security (PTS)</i>				
PTS1: Internet banking is a secure means through which to send sensitive information	0.976	0.968	0.979	0.941
PTS2: I would feel totally safe providing sensitive information about myself over internet banking	0.958			
PTS3: Overall internet banking is a safe place to send sensitive information	0.975			

**Notes:** 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); AVE = (summation of squared factor loadings)/(summation of squared factor loadings) (summation of error variances)

**Table I.**  
Measurement model

4.2 Structural model

Assessing the structural equation model involves evaluating lateral collinearity,  $R^2$ , path coefficient and corresponding  $t$ -values. In addition to these basic measures researcher should report predictive relevance  $Q^2$  and effect size ( $f^2$ ) (Hair *et al.*, 2014).

4.2.1 Lateral collinearity. According to Kock and Lynn (2012), though vertical collinearity is met, lateral collinearity (predictor – criterion collinearity) may sometimes mislead the findings. This type of collinearity is occurred when two variables that are hypothesized to be causally related measure the same construct. Thus, lateral collinearity was assessed with collinearity statistics VIF, values of VIF 3.3 or higher, indicates a potential collinearity (Diamantopoulos and Siguaw, 2006).

In this study, the inner VIF values for the other independent variables (compatibility, performance expectancy, effort expectancy, gamification, innovativeness, perceived technology security and intention to adopt) that need to be examined for lateral multicollinearity are less than 5 and 3.3 indicating lateral multicollinearity is not a concern in this study (Hair *et al.*, 2014). Table III depicts the results of lateral collinearity.

4.2.2 Hypothesis testing. For the hypotheses testing, path analysis was used to test hypotheses generated from the research model. To obtain the  $t$ -values, a bootstrapping procedure with 5000 resample was applied. Table IV depicts the results of path coefficient,  $t$ -statistics and significance level of the constructs.

Table IV shows the PLS estimation results. The bootstrap results indicated that performance expectancy had positive and significant influence on customer’s intention to

Model Constructs	C	EE	GAM	I	INT	INTRC	PTS	PE
Compatibility	0.866							
Effort expectancy	0.258	0.900						
Gamification	0.055	0.066	0.824					
Innovativeness	0.327	0.351	0.063	0.880				
Intention to adopt	0.467	0.436	0.074	0.708	0.881			
Intention to recommend	0.319	0.215	0.043	0.407	0.408	0.908		
Perceived technology security	0.296	0.278	0.009	0.516	0.771	0.281	0.970	
Performance expectancy	0.228	0.144	0.087	0.299	0.435	0.242	0.350	0.792

**Table II.** Discriminant validity using Fornell and Larker’s criterion

**Note:** Diagonal represents the square root of the average variance extracted while off-diagonal represent the correlations among constructs, diagonal elements should be larger than off-diagonal elements in order to establish discriminant validity

	C	EE	GAM	I	INT	INTRC	PTS	PE
C					1.187			1.119
EE	1.119				1.182			
GAM						1.005		
I	1.000	1.119			1.522			1.119
INT						1.005		
INTRC								
PTS					1.484			
PE					1.180			

**Table III.** The values of inner VIF

**Notes:** PE, performance expectancy; EE, effort expectancy; INT, Intention to adopt internet banking; INTRC, intention to Recommend; C, compatibility; I, innovativeness; PTS, perceived technology security; GAM, gamification

**Table IV.**  
Summary of  
hypothesis testing

Hypothesis	Relationship	Direct effect ( $\beta$ )	SE	T-statistics
H1	PE→INT	0.115	0.027	4.237***
H2	EE→INT	0.130	0.032	4.097***
H3	I→C	0.327	0.062	5.258***
H4	I→PE	0.251	0.052	4.796***
H5	I→EE	0.298	0.057	5.255***
H6	I→INT	0.330	0.055	5.970***
H7	C→PE	0.146	0.060	2.425*
H8	C→EE	0.161	0.066	2.436*
H9	C→INT	0.159	0.036	4.422***
H10	PTS→INT	0.477	0.055	8.618***
H11	INT→INTRC	0.407	0.058	7.057***

**Notes:** PE, performance expectancy; EE, effort expectancy; INT, intention to adopt internet banking; INTRC, intention to recommend; C, compatibility; I, innovativeness; PTS, perceived technology security. \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$  (one-tailed)

adopt internet banking ( $\beta = 0.115$ ,  $t$ -value 4.237, significance  $p < 0.001$ ) and confirmed the H1. Effort expectancy has shown significant influence on customer's intention to adopt internet banking and confirmed H2 ( $\beta = 0.130$ ,  $t$ -value 4.097, significance  $p < 0.001$ ). Next to this, H3 conveyed that innovativeness had significant influence on compatibility ( $\beta = 0.327$ ,  $t$ -value 5.258, significance  $p < 0.001$ ). Innovativeness had positive influence on performance expectancy of ( $\beta = 0.251$ ,  $t$ -value 4.796, significance  $p < 0.001$ ) and confirmed H4. Structural model results also confirmed H5 indicated that innovativeness had positive influence on effort expectancy ( $\beta = 0.298$ ,  $t$ -value 5.255, significance  $p < 0.001$ ).

Structural model result revealed that innovativeness led user's intention to adopt internet banking and confirmed H6 ( $\beta = 0.330$ ,  $t$ -value 5.970, significance  $p < 0.001$ ). Compatibility had significant influence on user's performance expectancy ( $\beta = 0.146$ ,  $t$ -value 2.425, significance  $p < 0.05$ ) and confirmed H7. Compatibility has shown significant impact on effort expectancy ( $\beta = 0.161$ ,  $t$ -value 2.436, significance  $p < 0.05$ ) and confirmed H8. Compatibility also had significant influence on user's intention to adopt internet banking and confirmed H9 ( $\beta = 0.159$ ,  $t$ -value 4.422, significance  $p < 0.001$ ). Findings confirmed the relationship between perceived technology security and intention to adopt internet banking ( $\beta = 0.477$ ,  $t$ -value 8.618, significance  $p < 0.001$ ) and confirmed H10. Finally, we found that users with higher intention had significant influence on intention to recommend internet banking services and confirmed H11 ( $\beta = 0.407$ ,  $t$ -value 7.057, significance  $p < 0.001$ ).

4.2.3 *Evaluating effect sizes ( $f^2$ ) and predictive relevance  $Q^2$ .* The model explains that 78.3 percent of variance in user's intention to adopt internet banking was jointly predicted by compatibility, innovativeness, performance expectancy, effort expectancy, and perceived technology security. Next to this PLS estimates revealed that 10.8 percent variance in performance expectancy was jointly predicted by compatibility and innovativeness. The model also explains 14.6 percent of variance in effort expectancy that was predicted by compatibility and innovativeness. Finally, the integrated model explains 10.7 percent variance in compatibility that was predicted by innovativeness.

We assessed the effect sizes ( $f^2$ ) and predictive relevance  $Q^2$ . According to Cohen (1988),  $p$ -value can show you that effect exist however, it does not disclose the size of the effect. Thus, assessing the effect size ( $f^2$ ) is essential. According to Cohen (1988) the acceptable effect sizes of ( $f^2$ ) values of 0.35, 0.15 and 0.02 are considered substantial, medium and small effect sizes respectively.

The predictive relevance of the construct is assessed with blindfolding procedure. Blindfolding procedure should only be applied to endogenous constructs that have a reflective measurement (Hair *et al.*, 2016). If the  $Q^2$  values are greater than 0 it revealed that model has predictive relevance for a certain endogenous construct (Cohen, 1988; Hair *et al.*, 2016). Table V summarized coefficient of determination  $R^2$ , predictive relevance  $Q^2$  and values and effect size ( $f^2$ ).

As it can be seen in Table V, there is a difference for the effect size analysis results. Concerning with user's intention to adopt internet banking results showed that innovative had medium size effect whereas perceived technology security had substantial effect size in determining user's intention. Therefore, the effect sizes of all other exogenous variables were found small with their endogenous variables. In order to evaluate predictive relevancy we found all the predictive relevance values  $Q^2$  were greater than 0 that depicts the proposed model has significant predictive relevance.

4.3 Importance performance matrix analysis (IPMA)

The IPMA builds on the PLS estimates of the structural equation model relationship and includes an additional dimension to the analysis of that latent constructs (Hair *et al.*, 2016). Thus, we ran IPMA using user's intention to adopt internet banking as target construct. The importance scores were carried from the total effects of outcome variable in structural equation model, while performance scores were derived by rescaling the latent variables score range 0 for lowest to 100 for highest as asserted by (Hair *et al.*, 2016). When the plotting results indicate high importance and low performance, it helps marketing and management personnel to identify major areas of improvement (Samar, Norjaya and Feras, 2017). Table VI depicts the total effects (importance) and index values (performance) used for the IPMA.

Table VI depicted that innovativeness has the highest importance (0.464) to determine user's intention to adopt internet banking therefore, it has medium level of performance.

Construct	$R^2$	$Q^2$	$(f^2)$	Decision
<i>Intention to adopt internet banking</i>				
Intention	0.783	0.569		
Performance expectancy			0.051	Small
Effort expectancy			0.066	Small
Compatibility			0.097	Small
Innovativeness			0.329	Medium
Perceived technology security			0.706	Substantial
Website design			0.054	Small
<i>Performance expectancy</i>				
Performance expectancy	0.108	0.062		
Compatibility			0.021	Small
Innovativeness			0.063	Small
<i>Effort expectancy</i>				
Effort expectancy	0.146	0.107		
Compatibility			0.027	Small
Innovativeness			0.093	Small
<i>Compatibility</i>				
Compatibility	0.107	0.066		
Innovativeness			0.119	Small

**Table V.** Effect size analysis ( $f^2$ ) and predictive relevance  $Q^2$

**Notes:**  $f^2$ : 0.02, small; 0.15, medium; 0.35, substantial

Hence, we can infer that innovativeness is the most important factor for managerial implications. Perceived technology security has the second highest importance to determine user’s intention whereas it has the highest performance level. Results showed a medium level of importance for effort expectancy and compatibility. Performance expectancy indicates lowest level of (0.117) importance. Thus, for managerial implication performance expectancy is not an important factor. Figure 2 depicts the index values and total effect scores.

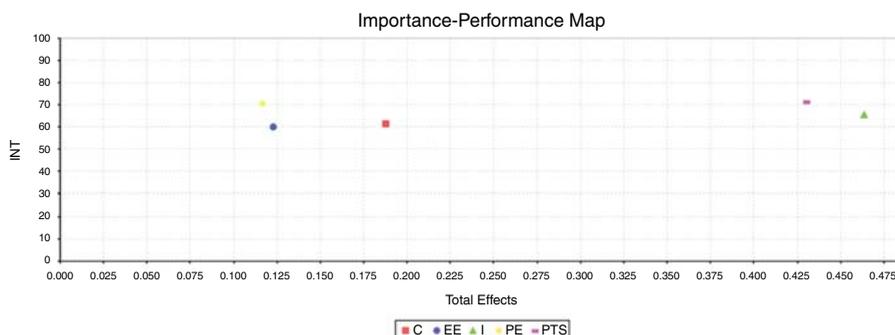
The importance performance map showed that innovativeness and perceived technology security are the most important factors to be taken into managerial consideration. Whereas compatibility and effort expectancy have medium level of importance and perform in order to determine user’s intention. In conclusion of IPMA, we imply that, managers and policy-makers should focus on improving the performance of innovativeness in order to enhance user’s intention toward adoption of internet banking.

#### 4.4 Moderating effect

A moderator variable is one that affects the relationship between two variables, so that the nature of the predictor on criterion varies according to the level or value of moderator. In this study, we hypothesized that the relationship between intention to adopt and intention to recommend internet banking is moderated by gamification. For moderating analysis, we have used the product–indicator approach as asserted by Chin *et al.* (2003). We created interaction terms between user’s intention and gamification. It is noted that when interaction effect entered into the model, the  $R^2$  increased from 16.7 percent to 18.7 percent. Bootstrap results revealed that the interaction effect between intention to adopt internet banking and gamification was significant ( $\beta = 0.150$ ,  $t$ -value 2.127,  $p < 0.1$ ). This indicated that positive relationship between user’s intention to adopt and intention to recommend is moderated by gamification.

Latent constructs	Importance (total effect of the latent variable Intention to adopt internet banking)	Performance (index values)
Compatibility	0.188	61.407
Effort expectancy	0.123	59.967
Innovativeness	0.464	65.804
Perceived technology security	0.431	71.314
Performance expectancy	0.117	70.681

**Table VI.**  
Total effects and index values



**Figure 2.**  
IPMA – importance-performance map (priority map) for customer’s intention to adopt internet banking

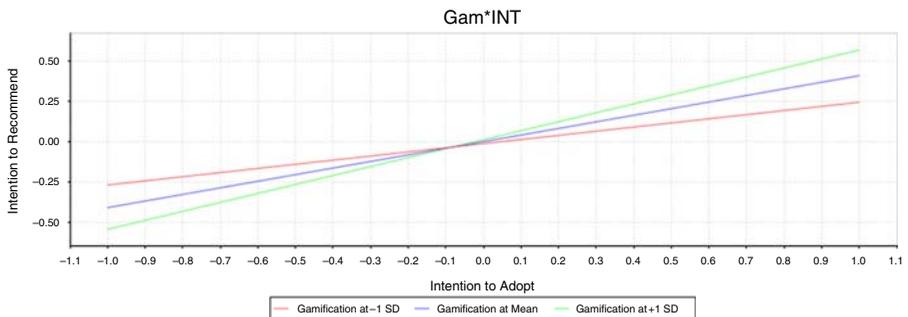
In order to understand how moderating variable strengthens the relationship between intention to adopt and intention to recommend, help was taken from simple slope analysis that visualizes the two way interaction effect from SmartPLS 3.2.6. In simple slope analysis (Figure 3), three lines depicted the relationship between user's intention (x-axis) and intention to recommend (y-axis). The middle line represents the relationship for an average level of the moderator gamification which is not useful to be interpreted in dichotomous or categorical data. Therefore, the other two lines are important to facilitate the interpretation of gamification as moderator between relationship of user's intention to adopt and user's intention to recommend, Gamification at +1SD (higher) and Gamification at -1SD (lower). We hypothesized that "The positive relationship between customer's intention to adopt and customer's intention to recommend will be stronger when Gamification is higher." It can be seen in Figure 3, the green line Gamification at +1SD has steeper and positive gradient when compared to red line Gamification at -1SD (Less steep and positive) depicted that positive relationship between user's intention to adopt and user's intention to recommend will be stronger when gamification effect is higher.

**5. Discussion**

We developed and tested new conceptual model to explain the influence of two well-known theoretical models, namely UTAUT and DOI in the adoption of internet banking and intention to recommend internet banking with gamification. The combination of innovation theory (DOI) and technology adoption theory (UTAUT) with perceived technology security explains 78.3 percent variance in customer's intention to adopt internet banking which is great than original UTAUT model (70 percent).

Based on the results, we verified that the relationship between performance expectancy and effort expectancy is significant for intention to adopt internet banking (*H1, H2*), consistent with previous research (Rahi, Ghani, Alnaser and Ngah, 2018). The results indicate that compatibility (*H4, H5*) and innovativeness (*H7, H8*) have positive direct influence on performance expectancy and effort expectancy and indirect effect (*H6, H9*) on user's intention to adopt internet banking, consistent with (Oliveira *et al.*, 2016). This implies that the more innovativeness and compatibility, the more customers' intention to adopt the internet banking. The findings revealed that (*H10*) perceived technology security is significant with customer's intention to adopt internet banking, consistent with previous study conducted by Samar Rahi, Ghani and Ngah (2018).

Another, findings highlighted by the results is the importance of user's intention to recommend internet banking in social networks. This is the most important contribution of our model. The results indicate that customer's intention to adopt internet banking is significantly influence on customer's intention to recommend internet banking to others (*H11*), consistent with Rahi, Ghani, Alnaser and Ngah, (2018) and Oliveira *et al.* (2016).



**Figure 3.**  
Simple slope analysis

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Very few studies report the moderating role of gamification in internet banking. Nevertheless, we proposed gamification (*H12*) the positive relationship between customer's intention to adopt and customer's intention to recommend will be stronger when gamification is higher. Results confirm that the positive relationship between user's intention to adopt and intention to recommend is moderated by gamification. This suggests that, marketers and web designer should pay closer attention on game mechanics during development of internet banking website in order to enhance user's intention to adopt and intention to recommend internet banking with others.

### 5.1 Practical implications

The results of this study shed light on important issues related to customer's intention to adopt and intention to recommend internet banking that have been ignored by previous studies. The findings of this study revealed that perceived technology security to be an important factor in explaining customer's intention. The study draws attention of policy-makers to ensure the possible environment for carrying out internet banking transaction. Managers should advertise that having internet banking transaction is secure, faster and productive. Second, the results of IPMA revealed that innovativeness is the most important factor affecting user's intention to adopt internet banking. Advertising about new technology with adequate information may produce positive influence on user's intention. Given this, innovativeness characteristics should receive closer attention from policy-makers and web designers. The third recommendation is based on technology specific characteristics (i.e. game elements) and environmental characteristics (i.e. intention to recommend to others). This study suggests that game elements may influence on user's intention to adopt internet banking and intention to recommend in social networks. Understanding social contribution is critical for marketers, as opinions through social websites and blogs may influence on user's intention to adopt internet banking. Therefore, enjoyable internet banking website with reward system would help to improve user's intention to adopt and recommend internet banking with others.

### 5.2 Theoretical implications

In term of theory building, we developed an innovative model that combines factors of two well-known theoretical models, UTAUT and DOI, with gamification, perceived technology security and intention to recommend. Compared with other investigation examined user's intention to adopt internet banking, our study presents a stronger explanatory power 78.3 percent than, Rahi, Ghani and Ngah (2018); Rahi, Ghani, Alnaser and Ngah (2018) with 6.64 percent. Understanding gamified internet banking (i.e. content information, website design, and webpage characteristics) is important especially in financial context. Results confirmed that positive relationship between user's intention to adopt and user's intention to recommend will be stronger when gamification effect is higher. Thus, studying gamified elements as moderator is one another contribution of our study. Finally, the proposed model makes an important contribution in emerging e-commerce literature especially in the context of innovative and gamified internet banking.

### 5.3 Limitations and future research

Although our study adds to the existing body of knowledge, it is important to recognize study limitations. We developed an integrated innovative model that combines factors of DOI and UTAUT with perceived technology security and intention to recommend, we cannot affirm that it explains all factors that influence on user's intention to adopt internet banking. Therefore, the newly developed model provide basis for further refinement of technology adoption models. Since intention to recommend is added in the model we

excluded social influence and facilitating condition constructs from original UTAUT model to avoid recurrence. However, adding moderating variables such as age and gender could reveal significant results. Prospect exist for future studies to examine how, the newly integrated model affect the relationship of constructs put across in this study in other cultural settings. It would be interesting to examine the current model in other developing region excluding South Asia.

## 6. Conclusion

This paper aims to develop an amalgamated model with DOI, UTAUT, perceived technology security and gamified elements to predict and explains customer's intention to adopt and intention to recommend internet banking in social networks. The results show that proposed model has good explanatory power and robustness to predict customer's intention toward adoption of internet banking. We advance the body of knowledge by adding moderating effect of gamification between user's intention to adopt and intention to recommend internet banking. The moderating effect of gamification revealed that the positive relationship between user's intention to adopt and user's intention to recommend will be stronger when gamification effect is higher. Besides these findings, we employed IPMA for managerial implications to see which factor is the most important factor among innovative (DOI) and technology adoption (UTAUT) factors. The results reveal that innovativeness and perceived technology security are the most important factors in order to determine user's intention with regard to adoption of internet banking. Thus, manager should focus on innovative characteristics and perceived security features in order to enhance users' confidence toward adoption of internet banking. Theoretically, this study provides basis for further refinement of individual adoption models and enrich the e-commerce literature adding innovative and game elements especially in interne banking adoption context.

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