Review of The Technology Acceptance Model (TAM) in Internet banking and Mobile banking

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Abstract

The adoption of new technology has been under debate since the 1970s. Over the decades, many theories and models have proposed to address the consumer adoption issues; one of them is the Technology Acceptance Model (TAM). The focus of this research article is to highlight the significance of the TAM model in explaining system adoption and usage in Internet banking and Mobile banking. This research paper will provide insight by providing a comprehensive review of the literature in the context of the TAM model its extensions, development, and shortcomings. This research study contributes to the existing literature; and will be beneficial for future researchers interested in Internet banking and Mobile banking research comprehending the TAM model.

Keywords: TAM model, TAM development, TAM limitations, Internet banking, Mobile banking

1. Introduction

Very popular and most frequently used theoretical framework in Information System (IS) and mobile banking research that has captured user attention is the TAM (Lai, 2017). Overall, the TAM model was 40% evidenced effective in predicting the system use (Legris, Ingham and Collerette, 2003). Davis (1985) purposed the Technology Acceptance Model (TAM) model in his doctoral research thesis. Davis (1985) in his conceptual model proposed that system features and capabilities stimulate user motivation that in response becomes the driving force to use actual system Figure 1.

![Figure 1. Conceptual TAM model](image)

The conceptual TAM model was further refined and modified (Davis, Bagozzi and Warshaw, 1989). The TAM was subject to various developments in the form of new theory, for instance, the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). The TAM theory was incorporated to predict user intention to adopt new technology in IS and mobile banking by the public in developed and developing countries. In fact, TAM is the extension of the generic Theory of Reasoned Action (TRA) presented by (Fishbein and Ajzen, 1975). However, the TAM theory set forth three fundamental determinants such as perceived usefulness (PU), perceived ease of use (PEOU) and attitude towards using the system for adoption and user acceptance of any new technology (Venkatesh et al., 2003; Chuttur, 2009; Bankole, Bankole and Brown, 2011; Govender and Sihlali, 2014; Shaikh and Karjaluoto, 2015;
Shaikh et al., 2015; Choudrie et al., 2017; Alzubi, Al-Dubai and Farea, 2018).

In his research, Davis (1989) proposed that user attitude is the significant determinant to evaluate whether the user will actually use the system or not. He introduced that user attitude is directly affected by perceived usefulness and perceived ease of use. Finally, he hypothesized that PEOU and PU influenced by system design characteristic X1, X2, and X3 as highlighted in the proposed research framework in Figure 2.

![Figure 2. Original TAM model](image)

**2. Overview of the TAM development**

The TAM model experienced many developmental phases and was further extended. According to Davis (1985) an individual who has strong behavioral intention might use the system without forming any attitude. Therefore, Davis et al. (1989) reformed the original TAM model by adding behavioral intention as a new variable that has directly affect by PEOU and PU. This gives rise to a new extension of the original TAM model as demonstrated in Figure 3.

![Figure 3. The first modified version of the TAM model](image)

Davis et al. (1989) conducted a longitudinal research on 107 users to verify the new modified TAM model and found the small and significant impact of perceived ease of use and perceived usefulness on behavioral intention. As a result, research construct attitude has removed from the resultant TAM model.

Another development of the TAM model was the consideration of external variable that might have the influence on the user's belief towards system usage. External variables X1, X2 and X3 introduced system characteristics, user participation, user training and process implementation (Venkatesh and Davis, 1996) in Figure 4.
Adams, Nelson and Todd (1992) conducted a study to test and authenticate the replication of the TAM model and its major constructs PEOU and PU in field and laboratory research. The research carried out on MBA students to check the consistency and validity of five digital applications and their actual use such as Harvard Graphics, Lotus 123, word perfect, email and voice mail. However, the researcher found that TAM model accurately sustained its prediction reliability to explicate system usage and its adoption.

A research conducted by Hendrickson, Massey and Cronan (1993) on the database and spreadsheet application to measure the reliability of PEOU and PU on TAM model. The participant of the research was 123 undergraduate students. The academic scholars found a significant impact of PEOU and PU in the test-retest result of reliability. A study replicated the TAM model by (Subramanian, 1994) on customer dial-up systems and voice mail. The participants of the study were 179 knowledge workers, the research results confirmed the results of previous studies conducted on the TAM model.

The TAM theory expanded the concept of TRA understand consumer behavior, attitude and intention to accept mobile banking (Kazi, 2013). The parsimony of the TAM model makes it one of the most widely employed models worldwide (Sitorus et al., 2017). Many new technologies such as e-commerce, mobile shopping (Jeong and Yoon, 2013), World Wide Web, the Internet (To and Lai, 2014), e-learning adoption (Mohamad Hsboollah, Kamil and Idris, 2009), internet banking (Radomir and Nistor, 2013), mobile banking (AlSoufi and Ali, 2014), mobile payments (Liébana-Cabanillas, Sánchez-Fernández and Muñoz-Leiva, 2014), online transactions (Çelik and Yilmaz, 2011), online gaming acceptance (Zhu, Lin and Hsu, 2012) and assistive social robots (Heerink et al., 2010) have examined and validated the TAM theory. In many studies, TAM used with some modification in relation to the concept of adoption and actual system usage (As-Sultan, Al-Baltah and Abdulrazzak, 2017).

3. Previous studies of Internet banking and TAM

Afshan et al. (2018) have investigated the framework of internet banking with extended TAM model and integration of additional risk factors in the Pakistani context. The data collected from 339 consumers through an online questionnaire. The structural equation modeling technique employed to evaluate the proposed framework. The significant influencing factors of the study are structural assurance, personal propensity to trust and familiarity with the bank, these factors affect the initial trust of the consumer to adopt internet banking in Pakistan. According to the authors, the research has a practical implication for a financial institution to formulate their strategies enhancing the adoption of internet banking.

Marakarkandy, Yajnik and Dasgupta (2017) integrated constructs into TAM model to discover internet-banking adoption in India. The incorporated variables include as perceived usefulness, perceived ease of use, perceived risk, trust, internet usage efficacy, internet banking self-efficacy, subjective norm, banks initiative, government support, image, trialability, and attitude. Four demographic dimensions education, income, gender

![Figure 4. The final verified version of the TAM model](image-url)
and age assembled into two groups in the augmented TAM model to test the moderating effect. A survey questionnaire used to collect data from 300 participants. Confirmatory factor analysis employed for the analysis of primary data. The findings of the research revealed that all the variables contribute to and supports the proposed model. Adoption of internet banking usage variation among variables found 26.5% and variation in the TAM model was 29.9% described by predictors variables in this research.

Alwan and Al-Zu’bi (2016) examined the determinants of internet banking adoption in Jordan. The data gathered from thirteen commercial banks active account holder consumers. The sample of 476 customers based on primary data analyzed using regression techniques. The results highlight that all variables significant influence on adoption whilst among all variables website quality and consumer trust were found the best predictors of consumer acceptance of internet banking. Although, consumer adoption rate is very low in Jordan. Consumers with a high educational background and high ability to use computer application are the actual users of this useful technology.

Lin, Wu and Tran (2015) examined the latent factors of internet banking adoption in Vietnam. According to the authors, internet-banking growing faster than e-commerce and other applied technologies. Two models theory of planned behaviors and technology acceptance model have combined in this research. Personal interviews conducted to collect data with respect to variables dived into seven groups (e.g. perceived ease of use, perceived usefulness, perceived credibility, subjective norm, perceived behavioral control, attitude to use and intention to use). Structured Equation Modeling (SEM) and the Analysis of a Moment Structures (AMOS) statistical 7.0 package software utilized for evaluation of the hypothesized associations among variables. Perceived ease of use found significantly effecting users attitudes. On the contrary, perceived credibility have not found any direct linkage with consumer’s attitudes. All other variables have consistent results with the proposed model and past studies.

Santouridis and Kyritsi (2014) state that internet banking offers round the clock banking access to its consumers. Furthermore, the scholars said that internet banking eliminates the anxiety that is caused by physical cash handing, lower transaction costs, save time and provide direct access from any location. In their research, the authors identified salient determinant that affects the adoption of internet banking in Greek. Primary research carried out using an interviewer-administered survey questionnaire. The widely used TAM model with external variables incorporated in the study. The sampled data consist of 266 consumers of internet banking. The linear regression analysis executed on sampled data to analyze the effect of external variables on consumer’s perception to accept internet banking. It is confirmed from the findings that easiness of use, usefulness and credibility found a significant impact on consumer’s perception using internet banking. Moreover, satisfaction and innovativeness also found strong predictor of users’ intentions in Greek.

Safeena et al. (2013) explore consumer’s adoption of internet banking in India. The data collected from 549 respondents using survey-based questionnaire. The variables employed in this research includes perceived usefulness, perceived ease of use, subjective norm, attitude and perceived behavioral. The findings of this research indicate that perceived usefulness implies the most significant predictors of consumer’s intention to accept internet-banking adoption. However, all other variables support the proposed hypothesis.

Kesharwani and Singh Bisht (2012) tried to examine security and privacy threat in relation to the adoption of internet banking in India. The theoretical basis of this research laid down by incorporating extended TAM model. The data collected from 619 respondents using the questionnaires. The analysis of data conducted by the use of AMOS 16.0 software version. The results of the research indicate that perceived risk negatively affects user’s behavioral intention to adopt internet banking. While trust and
perceived risk factors also have a negative relationship. However, this research found that a well-designed website could help to minimize users' risk concerns with respect to usage of internet banking.

Aslam, Khan and Tanveer (2011) have explored barriers influencing adoption of internet banking in non-metropolitan towns of Pakistan. Internet banking flourished rapidly in both developed and developing countries as a component of e-banking. The sample data collected from 520 active consumers of internet banking via the structured questionnaire. The data collected from the questionnaire analyzed by way of SPSS software. The results of the study reveal that the low perceived value of the internet banking, lack of knowledge and information found the most critical barriers to internet banking adoption in non-metropolitan towns of Pakistan. Moderate significant barriers that also hinders accepting internet banking includes the risk of hacking, lack of security, high financial risk, and fear of incomplete transactions. The researchers recommend that commercial bank should establish the effective way to address consumer's basic concerns.

Yaghoubi (2010) examined factors that affect online banking adoption in Iran. The authors state that online banking recognized as the most prominent and profitable e-commerce application. The research investigated TAM and the Theory of Planned Behavior (TPB) models combined. The primary data collected from 349 respondents and the analysis of the data made using SEM technique. The results depict that perceived usefulness and perceived behavioral control positively linked with the intention to use online banking. All other variables of the research signify its robustness to predict users' intention to accept the prompt service in the banking industry.

According to Lee (2009), internet banking has emerged as a profitable application of e-commerce. The scholar investigated factors affecting internet-banking adoption. In this study, two theories TAM and TPB employed along with perceived benefit and perceived risk. The data collected from 368 participants by providing them online questionnaire in Taiwan. The analysis of data conducted through AMOS software. The results of the study indicate that financial risk affected positively to perceived usefulness, perceived benefit and attitude. On the other hand, security/privacy risk adversely affected the users' intention to used internet banking in the Taiwanese context.

Table 1. Overview of selected articles on adoption of Internet banking

<table>
<thead>
<tr>
<th>Citation</th>
<th>Context</th>
<th>Constructs</th>
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<tbody>
<tr>
<td>(Afshan et al., 2018)</td>
<td>Internet banking adoption</td>
<td>Perceived usefulness</td>
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<td>Perceived ease of use</td>
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<td>Intention to use</td>
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<td></td>
<td></td>
<td>Risk dimensions (e.g. time, security, privacy, financial)</td>
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<td></td>
<td></td>
<td>Initial trust model (e.g. initial trust, structural assurance, propensity to trust and familiarity)</td>
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<tr>
<td>(Marakarkandy et al., 2017)</td>
<td>Behavioural intentions to use</td>
<td>Perceived usefulness</td>
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<td>Perceived ease of use</td>
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<td>Perceived risk</td>
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<td>Trust</td>
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<td>Internet usage efficacy</td>
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<td>Internet banking self-efficacy</td>
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<td>Subjective norm</td>
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<td>Banks initiative</td>
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<td>Study</td>
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<tr>
<td>(Alwan and Al-Zu’bi, 2016)</td>
<td>Internet banking adoption</td>
<td>Customer trust, Web service quality, Perceived ease of use, Privacy and security, Customer feedback</td>
</tr>
<tr>
<td>(Lin et al., 2015)</td>
<td>Intention to use</td>
<td>Perceived usefulness, Perceived ease of use, Perceived behavioral control, Perceived credibility, Subjective norm, Attitude to use</td>
</tr>
<tr>
<td>(Santouridis and Kyritsi, 2014)</td>
<td>Behavioural intention (BI)</td>
<td>Perceived usefulness, Perceived credibility, Perceived ease of use, Satisfaction with traditional bank branches – ATMs, Domain personal innovativeness, Web usage intensity, Prior e-shopping experience</td>
</tr>
<tr>
<td>(Safeena et al., 2013)</td>
<td>Intention to use IB</td>
<td>Perceived usefulness, Perceived ease of use, Subjective norm, Perceived behavioural control, Control, Attitude</td>
</tr>
<tr>
<td>(Kesharwani and Singh Bisht, 2012)</td>
<td>Behavioral Intention</td>
<td>Perceived usefulness, Perceived ease of use, Perceived behavioral control, Trust, Website design, Perceived risk, Social influence</td>
</tr>
<tr>
<td>(Aslam et al., 2011)</td>
<td>Internet banking services</td>
<td>Psychological barriers, Technical barriers, Demographic characteristics</td>
</tr>
<tr>
<td>(Yaghoubi, 2010)</td>
<td>Intention to use</td>
<td>Perceived ease of use, Perceived usefulness, Perceived behavioral control, Subjective norms, Attitude</td>
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4. Previous studies of Mobile banking and TAM

Academic literature reveals that empirical research studies based on the TAM model carried out to test adoption of m-banking facilities. The major constructs of the studies consist of PEOU, PU, user’s behavior, attitude, intention and adoption of mobile banking services (Koksal, 2016; Alalwan et al., 2016; Mohammadi, 2015; Mortimer et al., 2015; Hanafizadeh et al., 2014; Jeong and Yoon, 2013; Cheah et al., 2011; Kim,
Chawla and Joshi (2018) empirically investigated the adoption of mobile banking and tested moderating effect of demographic variables using TAM and the Diffusion of Innovation (DOI) Theory to observe the influence of these variables on consumer attitude on mobile banking in India. The moderator factors include age, gender, qualification, occupation, income, experience, and marital status. The data collected from the survey of 367 graduate-post graduate students and group discussion with eight public sector senior managers. Fisher Z transformation and multiple linear regression model was used to analyze the effects of moderating variables. The results of the research show that educational background has not found any moderating effect on user attitude. However, all other variables remain significant.

Another research conducted by Kumar, Lall and Mane (2017) in India considering TAM model fundamental variables PEOU and PU along with trust and social influence to analyze user's intention and found the positive significant influence of these variables with respect to mobile banking services. Arif et al. (2016) analyzed consumer's perception and intention to accept and adopt mobile banking in Pakistan. Modified TAM used with risk factors, for instance, security, privacy, time, and financial risk. The research result showed that PEOU and PU have a strong, positive influence on the user's attitude towards mobile banking. Furthermore, privacy and financial risks established the negative impact on attitude using the mobile banking service.

Koksal (2016) finds out the fundamental factors that highlight the user's high intention to accept mobile banking in the Lebanese context. The constructs investigated in this research are perceived usefulness, perceived ease of use, trialability, trust, perceived credibility, perceived self-efficacy, normative pressure, perceived financial cost, and compatibility. The structured questionnaire delivered to 776 users in Beirut for data collection and SPSS 21.0 utilized for evaluation of the data. The finding of the study reveals that perceived compatibility affects significantly consumer's intention to adopt mobile banking. However, trialability, PU, PEOU found the direct association with adoption. Privacy and security remain the consumer's concern that they expect bank not to disclose any information without their consent. The financial cost and normative pressure found no relation with adoption. Young consumers are more inclined to adopt mobile banking as compared with older ones in socio-demographic characteristics.

Alalwan et al. (2016) in their study examined consumer’ intention to adopt mobile banking. The key determinants of the model are PU, PEOU, self-efficacy and perceived risk used to analyzed the parsimonious model. The field survey of 343 Jordanian customers conducted and SEM model used for analysis of primary data. The statistical results indicate the value of R² is 58% it means that all the dependent variables showed 58% variance on behavioral intention. Thus, all variables entirely have an influence on consumer intention to adopt mobile banking in Jordan.

Mortimer et al. (2015) explored mobile banking motivation factors that influence a user's intention to adopt technologies in Asian economies. The data collected from two countries Thailand and Australia. The data collected using a web-based survey from 348 respondents. The results of data examined using path and invariance analyses, exploratory and confirmatory factor analyses techniques. The findings of the research reveal that PU, PEOU and perceived risk influence the consumer's intention in Australia. In addition, in Thailand social influence plays important role in determining users' behavior along with PU, PEOU and risk factors. The actual variance dependent variables to impact independent variables of research model remain 59.3% in Australia and 23.8% in Thailand. This research examined cross-cultural influencing factors of mobile banking adoption.

Cudjoe, Anim and Nyanyofio (2015) examined the mobile banking adoption determinants in the context of Ghana banking industry. The main research framework...
variables were PU, PEOU, awareness, social influence, compatibility perceived credibility perceived financial cost and perceived self-efficacy. They analyzed TAM theoretical framework to investigate research results and unveiled that Ghanaians users have negative behavior pattern to utilize mobile banking service. The survey from 150 sampled customers collected and SPSS version 20 used for evaluation. However, perceived financial cost, perceived credibility, security, and privacy are the biggest barriers and have the sound impact on user acceptance to use mobile banking technology other than PU and PEOU.

Govender and Sihlali (2014) presented a theoretical framework to investigate student’s behavior intention to adopt m-banking and employed extended TAM. The key variables of the proposed model were PEOU, perceived ease of adoption, social influence, trust, usage behavior and perceived value intention. The survey from 71 IT students gathered and regression analysis performed for estimation of the results. The results depict that R² of the explanatory variable was 42% it means that all variables absolutely influencing intention to use mobile banking as the dependent variable. In addition, the study reveals that TAM construct trust and perceived value had a strong predictor of the student's intention towards the adoption of m-banking services in KwaZulu-Nata a South African province.

Hanafizadeh et al. (2014) investigated Iranian clients to find out key elements that affect them to adopt mobile banking. In addition, the authors encouraged users to adopt cell phone banking to get the benefit of technology. Accordingly, the variables employed in this study were PU, PEOU, perceived cost, perceived risk, trust and need for interaction, perceived credibility compatibility with lifestyle. The survey questionnaire from 361 bank clients conducted and AMOS software package employed for analysis. The findings of the study reveal that all variables successfully described Iranian consumer’s behaviour especially trust and lifestyle remain the most significant factors in this study.

AlSoufi and Ali (2014) selected the kingdom of Bahrain to explore users’ perception of mobile banking adoption. To find out the influencing role of factors the following constructs quality of service, customer services, and self-efficacy, efficient transaction, alternatives, compatibility, perceived cost, perceived risk, perceived ease of use, perceived usefulness and intention to use incorporated in the research framework. The data compiled through the survey of 372 customers and SPSS package utilized for analysis. Some factors did not demonstrate any impact on consumer’s behavioral intention these factors include perceived risk and perceived cost. However, PU and PEOU remain among influencing factors to affect the user’s intention.

Abadi, Kabiry and Forghani (2013) carried out an exploratory study using the famous TAM model on the adoption of mobile banking to investigate the effect of this model on Isfahani user’s intention. The scholars found that PEOU, PU, and compatibility effect positively user’s intention to adopt mobile banking. However, trust and perceived risk showed insignificant and negative behavior with the proposed research model.

Chitungo and Munongo (2013) empirically analyzed unbanked rural communities in Zimbabwe. The authors test the application of the extended TAM model and found influencing factors of mobile banking adoption. Self-administered questionnaire from 275 unbanked rural consumers have composed and SPSS package used for analysis of the data. The variables of the study that remain significant were perceived ease of use, perceived usefulness, personal innovativeness, relative advantages and social norms. Whereas, cost and risk factors deterred the mobile banking services adoption.

Jeong and Yoon (2013) identified five factors that affect users behavioral intention of mobile banking adoption such as perceived financial cost, perceived self-efficacy, perceived credibility, perceived ease of use and perceived usefulness. Survey questionnaire from 165 respondents collected and least square multiple linear regression employed for the estimation of the results. The results of the study explain that users
and non-users of mobile banking have different perception and perceived usefulness was the most influential factor, however, perceived financial cost remain insignificant for all variables.

Aboelmaged and Gebba (2013) investigated two models TPB and TAM to provide insight related to consumer behavior of mobile banking adoption. The measurement item used in this study were perceived ease of use, attitude, perceived usefulness, subjective norm, behavioral control and mobile banking adoption. Survey of 119 respondents accomplished and regression analysis carried out for evaluation of the results. The construct subjective norm showed positive significant influence while usefulness and behavioral control found insignificant during the analysis.

Akturan and Tezcan (2012) investigated the user's perceptions and intentions of mobile banking adoption among youth. Seven risk dimensions such as performance risk, time risk, financial risk, psychological risk, privacy risk, social risk and security risk used in the research model. The data collected from 435 university students to analyze their risk perception attitude before the adoption of mobile banking. The SEM model utilized for assessment of the results. The findings described that perceived social risk; perceived benefit and perceived usefulness are the key factors that affect student behavior. In addition, no direct association among other variables noticed during the analysis.

Hsu et al. (2011) explored the mobile financial services (MBS) and customer adoption behavior. The research model developed adding variables such as subjective norms, perceived cost, perceived security and belief-related constructs. This empirical study contained 275 survey analysis and second-generation multivariate technique SEM used for estimations. The results directed that subjective norms, attitude perceived usefulness explain 74% about mobile financial service usage. On the other hand, variable cost showed no relationship effect with customer intention to use MBS.

Cheah et al. (2011) identified Malaysians consumer’s intention to accept mobile banking. The authors extended the well-known TAM model. The variable for extension used in this research comprises of perceived ease of use, perceived risk perceived usefulness, personal innovativeness, social norm, relative advantages and behavioral intention. A self-administrated questionnaire of 175 Malaysian consumers collected, multiple regression and factor analysis conducted for the assessment. Variables for example relative advantages, personal innovativeness, perceived ease of use and perceived usefulness exhibited positive linkage with the user's intention to adopt mobile banking. Whereas, social norms have shown insignificant findings. On the other hand, perceived risk negatively linked with the adoption of mobile banking.

Medhi et al. (2009) examined low-income and low-literate consumer of developing the country with respect to mobile banking adoption and usage in India, Kenya, South Africa and the Philippines. Several countries trying to provide financial services to the poor and unbanked population. The researchers set their parameters such that ease of use, the frequency of usage, pace of uptake, services adopted and household type to examine variation and usage of mobile banking. These variables in context with low-income and a low-literate segment of society are imperative understanding to evolve adoption and usage of mobile banking technology.

Crabbe et al. (2009) explored reasons regarding adoption and non-adoption of mobile banking technology. The main influencing factors of users intention in Ghana are perceived usefulness, perceived elitisation, perceived ease-of-use, perceived credibility, sustained usefulness, facilitating conditions, usage and sustained usage behavior, attitude and intention-to-use, individual differences, previous banking experience. A survey of 271 people compiled and exploratory factor analysis employed for the evaluation. The findings depict that demographic factors perceived elitisation and facilitating conditions perceived credibility have a substantial role in consumer adoption decisions.

One of the most valuable and used variable in the TAM model to explain the
adoption of new technologies is perceived usefulness (Shaikh and Karjaluoto, 2015). According to Davis (1989) perceived usefulness considered as subjective probability of user that system usage would increase job performance. Afterward, Davis (1993) refined the concept of perceived usefulness, as the degree of consumers believes that new technology usage would improve the overall performance.

Therefore, PU determines user’s behavior that using advanced technologies provide greater job autonomy and increase the performance level (Pikkarainen et al., 2004). PU regarded as the perception of the value of consumers from the probable use of new technology (Jeyaraj, Rottman and Lacity, 2006). PU is the user’s opinion that particular technology could enhance individual and organizational performance and as a result gave financial and non-financial benefits (Rauniar et al., 2014). PU represents efficiency and effectiveness as external variables (Ramayah and Lo, 2007).

Consequently, user’s favors the innovation that improves performance efficiency and rewards in a particular task. Consumers would consider the usage of new technology in mobile banking if it increases efficiency in a cashless transaction; provide accurate financial information and conducting routine banking operation (Pikkarainen et al., 2004). Moreover, the usefulness of mobile banking empowers users to use banking facility 24/7 basis without any restraint to a physical location. This perception of control on finances affects user’s behavioral intention to use m-banking services (Chitungo and Munongo, 2013). PU considered the significant and positive influencing factor on consumer’s attitude and system usage intention in adoption of m-banking facility (Alalwan et al., 2016; Talukder, Quazi and Sathye, 2014; Akturan and Tezcan, 2012; Nysveen, Pedersen and Thorbjørnsen, 2005).

Prior empirical research on technology adoption revealed that perceived ease of use (PEOU) considered another key determinant of system usage (Venkatesh and Davis, 2000; Gefen, Karahanna and Straub, 2003; Pikkarainen et al., 2004; Chan, 2004; Wang et al., 2003). PEOU is described as “the degree to which a person believes that using a particular system would be free from efforts” (Davis, 1989). According to Davis (1989), PEOU affects consumer attitude towards the adoption of new technologies. User's attitude has a straight association with the behavioral intention that regulates information system usage. PEOU is a very significant construct that affects acceptance of information system (Venkatesh and Davis, 2000).

Moreover, research scholar employed PEOU to analyze consumer understanding towards learning and using a system with no effort (Ezzi, 2014). PEOU and user’s intention association has investigated empirically in many countries in prior literature on mobile banking (Wentzel, Diatha and Yadavalli, 2013). A research conducted in Nigeria on mobile banking adoption among 500 participants reveals that PEOU influence the participant’s intention to use m-banking services (Olasina, 2015). Another study carried out to analyze consumer intention to use a technology in South Africa. The result indicates that people would utilize a facility only if they find it effortless (Wentzel et al., 2013).

PEOU is a fundamental factor that may have an impact on the user's intention to use a particular technology (Maroofi, Kahrarian and Dehghani, 2013). Furthermore, PEOU influence on consumer’s intention is subject to a specific task that the user wants to perform using a technology. Therefore, the banking institution should highlight the ease of using mobile banking (pay invoices, transfer money) when they advertise their services (Wang and Shan, 2013). M-banking financial facility has investigated to address technology acceptance in the Republic of Korea. The results indicate that user’s innovativeness and connectivity has a positive influence on PEOU towards m-banking (Lee, Trimi and Kim, 2013).
### Table 2. Overview of selected articles on adoption of M-banking

<table>
<thead>
<tr>
<th>Citation</th>
<th>Context</th>
<th>Constructs</th>
</tr>
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| (Abbas et al., 2018) | M-banking adoption | · Social influence  
· Perceived risk  
· Relative advantage  
· Ubiquitous finance control (UFC)  
· Personal innovativeness  
· Perceived trust |
| (Chawla and Joshi, 2018) | Attitude towards m-banking | · Perceived ease of use  
· Perceived convenience  
· Perceived efficiency  
· Perceived trust  
· Perceived lifestyle  
· Moderating variables |
| (Koksal, 2016) | Behavioral intention to adopt mobile banking | · Perceived usefulness  
· Perceived credibility  
· Perceived ease of use  
· Trust  
· Perceived self-efficacy  
· Trialability  
· Compatibility  
· Perceived financial cost  
· Normative pressure |
| (Alalwan et al., 2016) | Intention to adopt m-banking | · Perceived usefulness  
· Perceived ease of use  
· Perceived risk  
· Behavioural intention  
· Self-efficacy |
| (Mortimer et al., 2015) | Consumer’s intentions to use m-banking | · Need for interaction  
· Social influence  
· Perceived risk  
· Perceived ease of use  
· Perceived usefulness |
| (Cudjoe et al., 2015) | M-banking and consumer behavior adoption | · Social influence  
· Awareness  
· Perceived usefulness  
· Perceived ease of use  
· Compatibility  
· Perceived credibility  
· Social influence  
· Perceived financial cost  
· Perceived self-efficacy |
| (Hanafizadeh et al., 2014) | Intention to use m-banking | · Perceived usefulness  
· Ease of use  
· Perceived risk  
· Need for interaction  
· Perceived cost  
· Credibility  
· Trust  
· Compatibility with lifestyle |
| (Govender and Sihlali, 2014) | The actual use of m-banking | · Perceived ease of adoption  
· Social influence  
· Perceived value  
· Trust  
· Intention to use |
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<td>(AlSoufi and Ali, 2014)</td>
<td>Intention to use m-banking</td>
<td>Perceived cost, Perceived risk, Perceived usefulness, Perceived ease of use, Compatibility, Quality of services, Efficient transaction, Self-efficacy, Customer services, Alternatives</td>
</tr>
<tr>
<td>(Kazi and Mannan, 2013)</td>
<td>Intention to adopt</td>
<td>Perceived ease of use, Perceived usefulness, Social influence, Perceived risk</td>
</tr>
<tr>
<td>(Chitungo and Munongo, 2013)</td>
<td>Intention to adopt m-banking services</td>
<td>Perceived usefulness, Perceived ease of use, Perceived risk, Social norms, Relative advantages, Costs, Personal innovativeness</td>
</tr>
<tr>
<td>(Jeong and Yoon, 2013)</td>
<td>Adoption of m-banking services</td>
<td>Perceived financial cost, Perceived credibility, Self-efficacy, Perceived ease of use, Perceived usefulness</td>
</tr>
<tr>
<td>(Aboelmaged and Gebba, 2013)</td>
<td>Adoption of m-banking</td>
<td>Attitude, Behavioral control, Perceived usefulness, Subjective norm, Perceived ease of use</td>
</tr>
<tr>
<td>(Hsu et al., 2011)</td>
<td>Intention to use mobile financial services</td>
<td>Attitude, Perceived cost, Perceived security, Subjective norms, Perceived ease of use, Perceived usefulness</td>
</tr>
<tr>
<td>(Cheah et al., 2011)</td>
<td>Behavioral intention to adopt mobile banking</td>
<td>Personal innovativeness, Perceived risk, Perceived ease of use, Perceived usefulness, Relative advantages</td>
</tr>
</tbody>
</table>
5. Limitation in TAM model

The TAM model has also many limitations, which gave an opportunity to explore it further. Research scholars pointed out many criticisms of the TAM model such as TAM uses self-reported data instead of real and actual data. The subjective measure of the self-reported study is unreliable to predict actual system usage (Legris, Ingham and Collerette, 2003; Yousafzai, Foxall and Pallister, 2007). However, self-reported many research studies conducted on TAM using students as participants in a controlled environment cannot be generalized (Lee, Kozar and Larsen, 2003). Another criticism of TAM is that construct attitude may have significant effects on system usage and it should be reconsidered in the original TAM model. Affective and cognitive two additional constructs suggested and experimented with a research along with attitude exhibits positive results (Yang and Yoo, 2004).

Brown et al. (2002) replicate the TAM model in the banking sector and found different evidence regarding system usage in the mandatory environment and voluntary settings as applied by (Davis, 1989). Many research scholars conducted field research on mobile banking they found that due to lack of substantial features in the TAM model it is insufficient to exhibit influence on user’s behavioral intention (Taylor and Todd, 1995; Luarn and Lin, 2005; Schepers and Wetzels, 2007; Chitungo and Munongo, 2013). Similarly, Burton-Jones and Hubona (2006) employed TAM model on 125 US employees and found in results that PEOU and PU may not all effects system usage rather than any other external variables like age, education and experience had a direct impact on system usage.

Several researchers remarked that TAM model originally used to describe employee’s behavior in the organization to adopt new technology to improve work performance, where users accept new technology under a compulsory environment and without incurring the personal expense. Therefore, TAM has limitation and not sufficient to explain user acceptance of new technology in the case of mobile banking at his own expense in a voluntary environment (Kim, Chan and Gupta, 2007; Xiong, 2013).

However, the TAM model omits demographic, economic and external variable and unable to explain the adoption of mobile services adoption in relation to user's attitudes and behavioral intentions (Venkatesh and Davis, 2000). Therefore, many scholars used additional variables in 23 research as an extension of TAM in their theoretical framework for technology adoption such as personal innovativeness, relative advantage (Chitungo and Munongo, 2013), perceived security (Hsu, Wang and Lin, 2011), lifestyle and needs perceived cost of use and perceived risk (Hanafizadeh et al., 2014). Furthermore, Luarn and Lin (2005) state that the TAM model missed trust-based variables and assumes there is no barrier for the user to adopt the system. In fact, one

<table>
<thead>
<tr>
<th>Citation</th>
<th>Context</th>
<th>Constructs</th>
</tr>
</thead>
</table>
| (Medhi et al., 2009)   | Investigate variation in adoption and usage of m-banking | · Low-income  
                          |                                              | · Low-literate  
                          |                                              | · Key service adopted  
                          |                                              | · Household type  
                          |                                              | · Pace of uptake  
                          |                                              | · Ease of use  
                          |                                              | · Frequency of usage  |
| (Crabbe et al., 2009)  | Sustained usage of mobile banking            | · Perceived usefulness  
                          |                                              | · Perceived ease-of-use  
                          |                                              | · Attitude  
                          |                                              | · Behavioural intention  
                          |                                              | · Perceived elitisation  
                          |                                              | · Perceived credibility  
                          |                                              | · Sustained usefulness  
                          |                                              | · Facilitating conditions  
                          |                                              | · Demographic factors  |
of the noticeable limitations of TAM model omits significant aspects of user acceptance (Park, 2009; Shaikh and Karjaluoto, 2015).

Bagozzi (2007) remarked that there is a weak theoretical association between intention and actual use. He argued that intention is not representative of actual use because over time individual decision is subject to change to adopt new technology. Finally, Bagozzi considered TAM a philosophical theoretical model and the individual's intention to determine his act to use the actual system. Thus, he proposed that the TAM model is not suitable to predict and explain actual system use; therefore, the individual's intention needs to investigate further.

6. Conclusion

Davis purposed the TAM model to predict user intention to adopt new technology in information system and mobile banking. Davis in his conceptual model proposed that system features and capabilities stimulate user motivation that in response becomes the driving force to use the actual system. The TAM theory set forth three fundamental determinants such as perceived usefulness (PU), perceived ease of use (PEOU) and attitude towards using the system for adoption and user acceptance of any new technology. PU defined, as the degree of consumers believes that new technology usage would improve the overall performance. PEOU described as “the degree to which a person believes that using a particular system would be free from efforts”. The conceptual TAM model further refined and modified in 1989. The public in developed and developing countries incorporated the TAM theory to predict user intention to adopt new technology in m-banking. The parsimony of the TAM model makes it one of the most widely employed models worldwide. Many new technologies such as e-commerce, mobile shopping, World Wide Web, the Internet, e-learning adoption, internet banking, mobile banking, mobile payments, online transactions, online gaming acceptance, assistive social robots, computer science, engineering, management, operation research and psychology have examined and validated the TAM theory.

The TAM model has also many limitations, which gave an opportunity to explore it further. TAM uses self-reported data instead of real and actual use data. Several researchers remarked that TAM model originally used to describe employee's behavior in the organization to adopt new technology to improve work performance, where users accept new technology under a compulsory environment and without incurring the personal expense. TAM model omits demographic, economic and external variable. However, TAM is unable to explain the adoption of mobile services adoption in relation to user’s attitudes and behavioral intentions. Many research scholars conducted field research on mobile banking they found that due to lack of substantial features in the TAM model it is insufficient to exhibit influence on user’s behavioral intention. Therefore, TAM has limitations and not sufficient to explain user acceptance of new technology in the case of mobile banking at his own expense in a voluntary environment. The focus of this research article is to highlight the significance of the TAM model in explaining system adoption and usage in Internet banking and Mobile banking. Overall, the TAM model was 40% evidenced effective in predicting the system use.

A comprehensive amount of research work deal with the TAM. Since from its first appearance until the present review of this model indicates the popularity of the model in the context of technology acceptance. The TAM model originated in the psychological perspective now has evolved the fundamental model to understand the acceptance and rejection of human behavior. Numerous studies had confirmed its strength and prominence by applying this model to various technologies. Over the years, the presentation and classification of TAM-related research studies in two broad categories internet banking and mobile banking supported the good presentation of TAM research. The conducted review of the TAM model its extensions, development, and
shortcomings has specified consistent evolution of the model, still many unexplored areas related to theory, and practical aspects of technology adoption could facilitate the interested parties such as academic researchers, organizations, and government institutions. This research study contributes to the existing literature; and will be beneficial for future researchers’ desirous in Internet banking and Mobile banking research comprehending the TAM model.

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