Acceptance of Mobile Banking Application Services Offered by Sri Lankan Commercial Banks

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Abstract—Mobile banking services enable customers to conveniently patronage financial services through smart mobile devices. Present research analyses the effect of subjective norms and security aspects on mobile banking acceptance. University students who use mobile banking services have been considered for sample selection. Finally, completed 287 self-administered questionnaires were utilized for the data analysis process. Technology Acceptance Model has been adapted by means of incorporating the subjective norms variable and security of e-services variable. ANOVA, ANCOVA as well as Hierarchical Linear Model (HLM) were considered in analyzing data. Formulated hypotheses of the study were supported by the results. Cross-sectional nature and restrains on sample selection were recognized as limitations. Findings would be beneficial for banks, mobile banking service providers/application developers, regulators and related stakeholders, alike. Contextual application of HLM analysis, incorporation of associated models, contribute to originality. In quest of knowledge in wide-ranging country, cultural and societal settings, future researches may integrate relevant theoretical models and diverse perspectives.

Keywords—E-Services, Mobile Banking, Online Banking, Subjective Norms, Technology Adoption

I. INTRODUCTION

World economic growth is being hampered in the milieu of weakening international trade and investment activities as well as mounting trade tensions amongst leading economic hubs given the widespread pandemic repercussions. Since most advanced and emerging economies have recorded downturns, effects of same is currently being experienced by other countries as well (CBSL, 2021). As was the case with many emerging economies, key sectors of Sri Lankan economy remained under pressure for the second consecutive year. Contracted economic activities, widening of trade deficit, depletion of forex reserves and the sharp depreciation of the currency were among the main distress points for the economy. Services sector is the stimulus of the economic landscape in Sri Lanka which contributes highest to the economy where economic activities related to banking sector

remained resilient mainly due to the capital and liquidity buffers built over the past few years, total assets of the financial system and continued to expand at a reasonable pace during 2020 compared to 2019. (CBSL, 2021). The advancement of activities pertinent to service sector along the year was basically contributed through the progress of financial-services sector initiatives, without triggering significant macro-economic impacts amidst challenging dynamic market settings. Banking sector sustained to dominate the financial sector of the country, with 72.5 percent of the overall total assets (CBSL, 2021). Profitability of the Sri Lankan banking industry is being stagnated despite these facts, primarily owing to escalation of operational expenditure, inter alia. Therefore, addressing of same necessitates managing operational expenditure along with improving non-interest income simultaneously by expanding electronic onboarding, largely by promoting mobile banking service usage.

In accordance with higher internet penetration, substantial changes of customer behavior are being observed in recent years by most of the banks as escalating numbers opting for the convenience of attending to their banking requirements via online or by using their smart mobile devices, in comparison to visiting a physical branch. Process of transmitting encrypted data over telecommunication networks to a distant location for verification was a precursor to the telephone / mobile banking (Leech *et al.*, 2019). For sustaining innovative revolutionary developments, there is a wide-ranging digital transformation in the banking industry of Sri Lanka (HNB PLC, 2021). This strategy leverages the latest technological developments and almost all banks compete on several first-to-market products that have assisted in positioning respective banks as innovation leaders. Hence, banks are focused on expanding technology-based digital channel architecture enabling to increase the number of touchpoints which would inevitably assist expansion of

outreach, financial inclusion amidst outburst of the pandemic (Commercial Bank PLC, 2021; Sampath Bank PLC, 2021).

Accordingly, objectives of the study are given below, To identify the effect of security of e-services (SoES.) on acceptance of mobile banking (AoMB), To examine the effect of subjective norms (SN) on AoMB and To find out the interaction effect of SN and reason (R) on AoMB (R 1 noted as perceived ease of use - PEOU where R 2 is noted as perceived usefulness - PU).

In this section it is further elaborated that how security of e-services, subjective norms, perceived ease of use and perceived usefulness factors have influenced electronic banking rather mobile banking adoption, across varied country and societal contexts alongside empical findings. Privacy, security of e-services and user convenience are critical factors for accepting of retail e-banking services (Lim *et al.*, 2019; Poon, 2007; Zhou *et al.*, 2021). Perceived security was the most important factor, toward adopting of e-banking (Rahi Ghani, 2018). Security means the customers' trust for the site and sensing safe in providing sensitive privately held information (Zeithaml *et al.*, 2000). Security also denoted as risk-freeness and the capability to protect data against unauthorized accesses (Kim *et al.*, 2010). Similarly, security concerns are defined as safeness to disclose personal and financial information in interactions and transactions over commercial websites (Shareef *et al.*, 2011). Furthermore, no unveils or shares of user information with other parties or non-misuses are also expected.

Moreover, online security consists of 5 principles; integrity, privacy, verification, authentication and no repudiation actions (Taherdoost *et al.*, 2011). Besides, security used to protect confidentiality, integrity and also the availability (CIA) of data and system (Charney, 2008). Authentication, authorization and integrity are the constructs of e-security (Lai *et al.*, 2011). Four segments of security: availability, secrecy, non-repudiation and integrity are the real-life security related requirements. Similarly, availability, accountability, nonrepudiation, authorization authentication, integrity, confidentiality and etc. are elements included in information security (Weippl, 2005). Technology Acceptance Model (TAM) proposes that e-banking acceptance can be modeled with TAM's variables perceived usefulness and perceived ease of use (PU PEOU) with four others-perceived enjoyment, information. - online banking, security with privacy and quality of internet connection variables (Al-Dmour *et al.*, 2020; Nayanajith Damunupola, 2019; Thusi Maduku, 2020; Pikkarainen *et al.*, 2004). A study conducted in Sri Lanka, focused primarily on four factors - perceived risk (PR), PU, PEOU and subjective norms (SN). PEOU and PU are positively related to attitudes on e-banking whilst PR and the subjective norms have weak a positive relationship (Priyangika *et al.*, 2016).

A. Conceptual Framework and Theoretical Perspective

TAM is an adaption of reason action theory, as found in literature (Fishbein, 1976; Fishbein Ajzen, 1975; Davis, 1989; Davis, Bagozzi, Warshaw, 1989). TAM explicates acceptance and usage of technology (Nayanajith Damunupola, 2020; Venkatesh, 2000). Davis and Bagozzi developed TAM (Bhattacherjee , 2001; Davis 1989; Bagozzi, Davis Warshaw 1992). Suh and Han (2002 2003) were the first to consider cross-national effects of e-banking customers. Combined of TAM and commitments trust theory used to understand continuance intentions (Vatanasombut *et al.*, 2008). Integrating factors, integrating alternative belief factors and examining PU and PEOU related antecedents and moderators make modifications to TAM (Nayanajith *et al.*, 2020; Nayanajith, 2020).

Similarly, "affiliation between attitudes and human behaviors within human actions is, elaborated by Theory of Reasoned Action (TRA). This theory has been derived from the findings of the previous researches in social-psychology fields, persuasion models and attitude related theories (Fishbein, 1967; Fishbein Ajzen, 1975). SN are also one of the important determinants towards behavioral intentions and denote the way perceptions of relevant groups or individuals for instance the family members, friends, peers and related others, that might affect performance of the behavior of particular person (Fishbein, 1967). SN could be defined as the specific perceived social pressure to perform or not perform the behavior by an individual (Albarracin Ajzen, 2007; Nayanajith *et al.*, 2020). As stated by the TRA, individuals develop certain beliefs rather normative beliefs as to whether or not the certain behaviors are acceptable (Fishbein Ajzen, 1975). Beliefs form person's perception of the behavior and determine his/her intention to perform or not to perform the particular behavior (Albarracin Ajzen, 2007; Fishbein Ajzen, 1975)". Referring to the aforesaid, following conceptual model was proposed as shown in Figure 01.
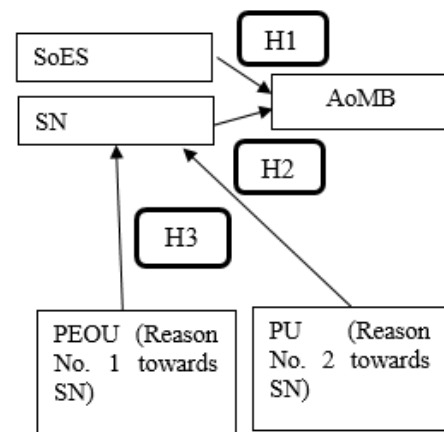

Figure 1: Conceptual Model

1) Hypotheses of the Study:

- $H_1$1-SoES predicts AoMB significantly.
- $H_1$2-SN predicts AoMB significantly.
- $H_1$3- Interaction of SN and R predicts AoMB significantly.

2) Operationalization: Operationalization provides a direction to measure each variable of the framework and to translate into comprehendable and measurable elements, to develop an index of concept related measurement. Operationalization involves defining the constructs that needed to be measured, considering the content of the measure and the determination of a response format/scale. Amongst the two variables in TAM with regard to the technology adoption concept which is being used in relation to adoption/usage of e-banking, the first variable: perceived usefulness (PU), is defined as the "users' subjective probability that using a specific application system will increase his or her job performance" (Davis et. al., 1989, p. 985). Initially, this is defined in the context of one's job performance, PU was later used for any common tasks (as in the case of internet/online shopping) in non-organizational settings (Gefen, 2002). And the second variable named as perceived ease of use (PEOU), is defined as "the degree to which the user expects the target system to be free of efforts" (Davis et. al., 1989, p. 985). Hence, PU is defined in this study as "the belief of the customer that the online banking is useful for the banking needs" and PEOU is defined as "the belief of the customer that the online banking is free of hard efforts".

In practice, technology alone is not adequate to ensure the e-service security (Lebanidze, 2004; Santos, 2003; Zhang *et al.*, 2012). Likewise, Taherdoost *et al.* (2011) noted five core principles. In addition, Charney (2008) suggested a framework known as 'CIA' of data and system. Lai, Tong and Lai (2011) also recognized the constructs of e-service security. According to Weippl (2005) there are four segments of security. Similarly, this can be extended with additional elements including information security as the availability, user accountability, user authentication, counter party integrity, non-repudiation, authorization, confidentiality and etc. Following table I depicts the operationalization table.

II. Methodology

In view of the ontological and epistemological grounds pertaining to deductive methodology, this research study has been conducted following the deductive methodology that could be described as "the top-down process in which the researchers arrive at a reasoned conclusion by logical generality of known fact/facts. That is, going from general to specific. Research methods under this technique include experiments, survey techniques, and observation. Quantitative research findings are particularly descriptive, empirical and in particular generalizable (Saunders, 2011). In this study deductive methodology and quantitative methods have been used. First of all, the questionnaire survey was deemed suitable for the type of data that the researcher gathered as the major part of the study is related with the respondents' perceptions of mobile banking and how these perceptions influence their adoption of mobile banking". Secondly, questionnaires can be employed to examine and explicate relationships between numerous variables (Saunders, 2011). In the same way, additional reasons were also there suggesting a questionnaire survey, notwithstanding the necessity of a larger sample and consideration given to the fact that the cost of a questionnaire survey is cheaper in comparison to an interview survey.

Accordingly, survey questionnaire was prepared with reference to a 5-point Likert scale in which the questionnaire responses were named using 'strongly disagree, disagree, not sure, agree and strongly agree' phrases and assigned values from 1-5, correspondingly in view of measuring the variables. Subsequently, those responses were converted to high, medium and low values in the following manner, 1 - 2.33, low; 2.34 - 3.66, medium; 3.67 - 5, high, respectively in order to arrive at composite values for the variables measured in this study. Questionnaire's content validity is ensured through literature review and integrating the concerns raised by the e-banking experts in several leading private commercial banks in Sri Lanka. Construct validity is an important characteristic which is concerned with the extent to which a particular measure relates to other measures consistent with theoretically derived hypotheses concerning the concepts (or constructs) that are being measured (Blomberg *et al.*, 2008; Saunders, 2011). Convergent and discriminant validity are the two subtypes of validity that constitute construct validity. The current study ensures both convergent and discriminant validity. Reliability of the scale is ensured via Cronbach's alpha.

Respondents were students from University of Kelaniya who are utilizing mobile banking facilities of selected private commercial banks and they were participants of the weekend study programs conducted by the university. They were selected using random sampling method as per registration numbers. Data collection was executed via self-administered questionnaires. 400 questionnaires were distributed and finally, 287 duly completed research questionnaires were used for the data analysis process.

III. Results

Data analysis of the study was deployed using the IBM SPSS 20 package. The sample pertinent to the research comprised higher proportion of males (52.6 percent) in comparison to females (47.4 percent). Additionally, in terms of education major portion was represented by A/L qualified persons (65.9 percent) and 11 percent qualified as graduates while postgraduate and professional qualification possessors were recorded as 8.9 percent and 14 percent respectively. Age distribution statistics revealed that, the vast majority of respondents (64.5 percent) were aged between 25–50 years where the married personnel count reported as 65.8 percent. Furthermore, when the income is considered, 65.2 percent recorded in the income segment that lies between Rs. 60,000/- to Rs. 120,000/-. Therefore, the socio-demographics is consistent to further examine the research problem as demographic and social characteristics of the population are replicated mostly by the sample under study.

At first, a "reliability analysis was performed enabling to identify internal consistencies of the total scores for each scale using Cronbach's alpha coefficients (Field, 2013).

Table I: Operationalization Table

Concept	Variable	Measurement indicator	Source
Technology acceptance	Perceived usefulness	Belief on enhance of the job performance	Davis *et al.*, 1989
	Perceived ease of use	Belief of particular system will be effort free	
SoES	Perceived authentication	The procedure of specifying specific individual's identity	Taherdoost *et al.*, 2011
	Perceived availability	Percentage of operating time.	Lai et al., 2011
	Perceived confidentiality	No access to the Info. that should not be accessed	Weippl, 2005
	Perceived integrity	Process to ensure that third parties do not alter system info.	Hwang *et al.*, 2007; Tsiakis & Sthephanides, 2005
	Perceived non-repudiation	It refers to leave no possibility for denying.	Lebanidze, 2004
	Privacy	Customer's perception of one's ability to control/monitor the collection, use of information	Taherdoost *et al.*, 2011; Yousafzai *et al.*, 2010
Theory of reasoned action	Subjective Norms	Behavioral intentions and denote the way perceptions of relevant groups or individuals who might affect one's performing of the behavior	Fishbein, 1967; Fishbein & Ajzen, 1975; Albarracin & Ajzen, 2007

Consistent with the research findings, all reliability figures for variables were noted as adequate since Cronbach's alpha coefficient figures are greater than 0.7 (Field, 2013; George Mallery, 2003). Furthermore, K-S test, Levene's test and linearity test were performed to confirm normal distribution of the collected data, homoscedasticity and linearity aspects and results found that they are not significant. As per the descriptive statistics, variables have recorded high level figures as all the composite mean figures are above 3.66 threshold figure (where 5-point Likert scale figures starting from strongly disagree, disagree, not sure, agree and strongly agree, have been converted to low, medium and high values in the following order, 1-2.33, low; 2.34-3.66, medium; 3.67-5, high, respectively). There were six constructs for the variable named as security of e-services and subsequently the composite mean was recorded at 3.71 while the dependent variable; AoMB has reported a mean of 4.39. Table II demonstrates the results of one-way ANOVA test output, analyzing the effect of SN on AoMB", is significant (p = .000), where F (1, 284) = 14.914.

Subsequently, a model was gradually developed with additions of level 2 variables (banks-random intercepts). Thereafter, model was changed by incorporating random intercepts (banks) and random slopes (SN). After that, analysis was performed using HLM (along with covariate in between intercepts and slopes). Later on, analysis was conducted using HLM again (adding R towards SN and interaction-R*SN), that recorded Chi-square change of 65.69 (-121.408 - -187.098). And also df change = 9-7 = 2, model fit has been improved since corresponding chi-square critical figure with 2 df is 5.999 (p < .050) 9.20 (p < .010), presently, subjective norm is significant as per significant p value (p = .034), SoES too is significant (p = .000), R Significant (p = .049), interaction of subjective norm and reason (R) is also significant, (p = .000), regression coefficient of subjective norm is .424, above all predict AoMB. The most interesting effect is the interaction, as it illustrates the effect of R for subjective norm, in considering whether the respondent had subjective norm or not (ref. table III).

Respondents with subjective norm in considering PEOU, subjective norm did not predict AoMB significantly (p =.416), where the gradient was positive (b = .114). Also, SN in considering PU also, did not predict AoMB significantly (p =.827), whereas the slope was negative (b = -.0631). Hence, it demonstrated that for those who had subjective norm taking account of PEOU, the subjective norm has led towards the easiness and thus, their adoption increases as against those had subjective norm taking account of PU, would have realized that usefulness was not the issue for them, where AoMB has recorded a lower magnitude.

IV. DISCUSSION

Results revealed that, AoMB significantly predicts SN as per ANOVA results. Nevertheless, in ANCOVA with SoES (covariate), SN do not significantly predict AoMB (Although analysis of this was not a primary objective, same was performed to understand the covariate effect). Subsequently, a model was gradually developed with additions of level 2 variables (banks-random intercepts). Thereafter, model was changed by incorporating random intercepts (banks) and random slopes (SN). After that, analysis was performed using HLM (along with covariate in between intercepts and slopes). Later on, analysis was conducted using HLM again (adding R towards SN and interaction-R*SN), and model fit has been improved. At this stage subjective norm, SoES, R, interaction of subjective norm all predicted AoMB. Prior researches also supported positive relationship of SN and security of e-services on electronic banking adoption (Al-Dmour *et al.*, 2020; Bryson *et al.*, 2015; Deb Lomo-David, 2014; Nayanajith *et al.*, 2020; Perera, 2013 as cited by Rajapakse, 2017; Thusi Maduku, 2020). In accordance with final HLM, it is reported that AoMB, upon controlling for SoES, is being lower for the respondents who possessed SN in view of PU than those who had subjective norm thinking of PEOU.

V. CONCLUSION

Current study was conducted to determine the significance of subjective norms, SoES, reason towards subjective norms

Table II: ANOVA test output

	Sum of Squares (SS)	df	Mean Square (MS)	F	Significance (S)
Between Groups	2.928	1	2.928	14.914	0
Within Groups	53.448	285	0.188		
Total	56.377	286			

Table III: HLM upon adding of R on SN and interaction (R * SN) - EoFE[a]

Parameter	Est.	Std. Err.	df	t	S	95% CI LB	UB
Intercept	1.87783	0.26117	17.904	7.19	0	1.328922	2.426741
SN	0.425807	0.148915	5.139	2.859	0.034	0.046101	0.805514
SoES	0.571683	0.024157	283.43	23.665	0	0.524133	0.619234
R	0.15323	0.077619	280.25	1.974	0.049	0.000439	0.306021
SN * R	-0.21992	0.045524	280.08	-4.831	0	-0.30954	-0.13032

a. DV: AoMB.

Table IV: HLM rerun output distinctly for different 2 reasons SN taking account of PEOU

Parameter	Est.	Std. ErR.	df	t	S	95% CI LB	UB
Intercept	2.23346	0.228606	9.985	9.728	0	1.791783	2.855153
SN	0.114819	0.124827	3.948	0.903	0.416	-0.23732	0.464958
SoES	0.615894	0.02755	187.684	19.019	0	0.471349	0.580438

a. R = PEOU / b. DV: AoMB.

SN taking account of PU EoFE[a,b]

Parameter	Est.	Std. Err.	df	t	S	95% CI LB	UB
Intercept	3.18838	0.363902	27751.58	8.762	0	2.475118	3.901647
SN	-0.06312	0.290607	27095.49	-0.217	0.827	-0.63263	0.506584
SoES	0.327727	0.008926	91.127	36.715	0	0.309996	0.345458

a. R = PU / b. DV: AoMB.

and interaction of subjective norms and reason on AoMB in the context of private commercial banks operating in Sri Lanka, in which data had two of the levels of hierarchy; viz individual respondents and the banks to which the individual respondents belonged to. HLM together with "random slopes, random intercepts along with covariance of random intercepts and random slopes", exhibited that subjective norms, SoES, underlying reason and interaction factors are predicting significantly AoMB. Difference in slopes for subjective norms, as a predictor for AoMB, in view of both the reasons named as PU and PEOU, were indicated by the interaction effect. Empirical evidenceof this research have supported the first and second hypotheses proposing the importance of subjective norms, SoES towards AoMB. Further, the interaction of subjective norms and reason towards same (whether the reason is perceived ease of use or perceived usefulness), also predicted significantly by AoMB, as supported by the third hypothesis.

Present research is also subjected to some limitations which restrain the reliability to generalize the research's empirical findings to whole population. At the outset, as respondents were the university students (who are enrolled for weekend certificate/diploma/under-graduate and post-graduate programs), who are using mobile banking services it would be possible to record different outcomes in performing a research in a different context as the participated respondents would not precisely replicate the whole mobile banking customers attached to the selected local commercial banks. As there were restrictions and limitations due to cross-sectional nature of the study and sample selection, researches in time to come would be executed with higher representation of the whole population to support the diverse research findings. Simultaneously, findings of the research could be used by the commercial banks and IT vendors developing banking applications, regulators and allied stakeholders in view of enhancing the mobile banking adoption level throughout the country. Easy to use, cost efficient and secured mobile banking services alongside high penetration of mobile and internet connections with substantial smart mobile devices may drive greater financial inclusion. Correspondingly, such developments may sustain for the betterment of the society at large whilst unearthing considerable profitability and performance expectations for the Sri Lankan banking fraternity for mutually rewarding long-term relationships (Jayasiri *et al*., 2015). Contextual application of HLM analysis, incorporation of associated models, contribute to originality. In quest of knowledge in wide-ranging country, cultural and societal settings, future researches may integrate relevant theoretical models and diverse perspectives.

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