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Fintech, Sustainability and Financial Inclusion – Establishing the Link Among the Trio: A Research Model

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ABSTRACT

This paper studies the impact of attitude towards fintech adoption on sustainable financial inclusion of a population in the extended TAM model. Judgmental sampling technique has been used for data collection using a structured self-administered questionnaire based on five-point Likert scale. The data collected is then statistically analysed using SPSS and AMOS software. Results reaffirmed that the independent variables like perceived usefulness, perceived ease of use, perceived social equity, responsible financial practices and trust have a positive impact on the attitude towards fintech adoption, which in turn has a significant positive impact on sustainable financial inclusion. Also, it was revealed that perceived risk has a significant negative impact on the attitude towards fintech adoption. These findings shall be helpful in policy and strategy formulation of the government and fintech firms in accordance to united nations sustainable development goals and world bank financial inclusion initiatives. The work is limited to a certain geography and do not include demographic characteristics like gender, income level, financial literacy, living conditions which may be further studied.

INTRODUCTION

Fintech generally refers to the industry that combines technology in delivering financial solutions. It is the financial industry that applies technology to improve financial activities (Schueffel, 2016). According to Knewtson and Rosenbaum (2020), fintech is the technology that is used to provide financial markets a financial product or service, that is characterized by sophisticated technological use relative to existing technology in that market. Financial innovation in the form of new delivery channels, products, and providers has helped in expanding the boundaries of access to finance and increasing the bankable and banked population in the process (Beck, 2020). Vallee and Zeng (2019) researched the difference between conventional banking and an emerging FinTech area, and noted that credit decisions made in FinTech uses different and more vibrant set of information than used in traditional credit decisions. Fuster et al. (2019) in his research revealed that the innovation offered by FinTech lenders reduces processing time 20% while examining the creditworthy of its customers. Arner et. al. (2020) argued that financial technology (FinTech) is the key driver for financial inclusion, which in turn underlies sustainable balanced development, as embodied in the UN Sustainable Development Goals (SDGs).

Financial inclusion means the delivery of financial services, including banking services and credit, at an affordable cost to the vast sections of disadvantaged and low-income groups (Chhabra, 2015). Financial inclusion aims to the participation of vulnerable groups such as weaker sections of the society and low-income groups, based on the extent of their access to financial services such as savings and payment account, credit insurance, pensions (Singh et al., 2014). Agrawal (2008) studied the financial inclusion from the behavioural perspective from both supply and demand end. Results revealed that the behavioural perspective provided the scope for the policy-makers and marketers to strategically align their approach, without limiting their thoughts to the economical evaluations. Paramasivan and Ganeshkumar (2013) discussed the overview of financial inclusion in India and concluded that number of bank branches has a significant impact on financial inclusion. Mukherjee and Chakraborty (2012) studied the role and efficiency of the commercial banks in Jharkhand state with their capacity and role of institutions like regional rural banks (RRBs), self-help groups (SHGs), non-banking financial companies (NBFCs) for the purpose of promoting financial inclusion. Another

research revealed the positive significant impact of number of bank branches and credit deposit ratio of banks on GDP of the country. This study observed that financial inclusion is strongly associated with the progress and development of the economy (Iqbal & Sami, 2015).

Sustainability gets its inspiration from the word *Nachhaltigkeit* (the German term for sustainability) was first used with this meaning in 1713. The term sustainability has become popular in policy-oriented research as an expression of what public policies ought to achieve (Wiersum, 1995). It refers to the concept of meeting the needs of the present without compromising the ability of future generations to meet their own needs. The United Nations can up with the Sustainable Development Goals (SDGs), also known as the Global Goals, in 2015 with a set of 17 interconnected goals that provide a comprehensive framework for sustainable development, addressing key global challenges and guiding efforts to achieve a more equitable, inclusive, and sustainable world by 2030 (Nations, 2016).

THEORETICAL BACKGROUND & HYPOTHESES FORMULATION

Earlier research in the field of fintech has used Technology Acceptance Model (TAM) as a model to predict user's intention to adopt fintech technology and offerings. Proposed by Davis (1989), TAM model uses perceived usefulness and perceived ease of use and the major independent variables used to predict the attitude towards adoption of a technology which in turn predicts the actual use of that technology. FinTech affects income inequality directly and indirectly through financial inclusion (Demir, et. al., 2022). Financial technology uses digital platforms to deliver financial services to consumers and businesses through digital devices such as smartphones and has become an important tool to promote financial inclusion (Morgan, 2022). Financial inclusion is especially increased for households that traditionally consumed less, which indicates that FinTech could reduce consumption inequality (Yang & Zhang, 2022). Researchers have earlier concluded that fintech helps in accelerating the green and inclusive financial markets further realigning finance to support sustainable development (Moro-Visconti et. al, 2020). Fintech is a driving force for sustainable economic growth with several effects on social, environmental, and ecological benefits. For environmental and ecological development, Fintech can promote the use of funds for energy and environmental projects, along with the construction of renewable energy and environmental infrastructure. It indicates that, sustainable finance and Fintech have many shared aspects, and Fintech can make financial business overall more sustainable, as it promotes green finance (Chueca Vergara & Ferruz Agudo, 2021). Le et. al (2019) concluded that the growing financial inclusion negatively affects financial inefficiency while favourably influences financial sustainability. Sharma (2016) based on causality analysis deduced that there is a bi-directional causal relationship between geographic outreach and economic development as well as a unidirectional causality running from the number of deposits/loan accounts to GDP.

Apart from perceived usefulness and perceived ease of use, earlier research in the field of fintech, financial inclusion and sustainability, have highlighted the role of other independent variables namely, perceived social equity, responsible financial practices, perceived risk and trust. Fintech promotes financial inclusion which acts as an enabler and accelerator of economic growth as well as fintech platforms has the ability to channel resources into achieving sustainable social goals (Cosma & Rimo, 2023). Another study by Ghouse and Iqbal (2023) concluded that Fintech ensures equal access while promoting sustainable resource extraction and provides long-term societal benefits. Dimer et. al (2022) concluded that while financial inclusion significantly reduces inequality at all quantiles of the inequality distribution as well as reduces social inequality. Yang and Hong (2023) concluded that Fintech can increase the use of financial services to narrow the digital divide, thus reducing educational inequality. Also, fintech indirectly addresses educational inequality by increasing household income and consumption, along with public education expenditure. Almack (2023) highlights the need of responsible innovation and its acceptability in the field of Fintech. Fintech is revolutionising the financial services industry and is likely to have a major impact on personal financial planning, well-being and societal welfare through responsible financial practices (Panos & Wilson, 2020). It was revealed that the finance principles of integrity and fairness have the most significant relationships with Machine Learning ethics (Rizinski, et. al, 2022).

Liu et. al (2021) concluded that Fintech trust positively and significantly impacts on ROE, ROA and NIMP of an organisation in both linear and non-linear models of their study. Stewart & Jürjens (2018) definitely confirm that data security, customer trust and the user design interface affect the adoption of FinTech. Another research concluded that data security, customer trust and user design interface strongly affect the intention to adopt Fin Tech (Nayak et. al, 2021). A study revealed that mobile perceived trust (MPT) which is the trust in using financial business models delivered through mobile technology, is a crucial factor in the FinTech context and positively effects the intention and adoption of different FinTech business models (Dawood, et. al, 2022). Roh et. al (2024) in their research found out that both consumers' perceived security and privacy are positively related to consumers' trust in such services, which further encourages the formation of both positive attitudes toward those fintech services and intentions to use. Their study also revealed that a trust-enhanced strategy is required to improve the quality of fintech service, user security and privacy protection, and consumers' behavioural attitudes and intentions. Further, earlier studies have also highlighted that perceived risk negatively affects fintech adoption and intention to use resulting in lower acceptability of a Fintech and its actual use (Abdul-Rahim et. al, 2022). A similar study conducted by Saleem (2021) concluded that the relationship between Fintech revolution adoption intention was negatively influenced by perceived risk. Research on sustainable development of Fintech confirmed that the system quality is negatively related to perceived risk, whereas information quality is positively related to trust (Ryu & Ko, 2020). A study by Tang et. al (2020) demonstrated that the financial risk, legal risk and operational risk have a significant negative impact on the intention to use FinTech. Haqqi and Suzianti (2020) concluded that privacy awareness, financial risk, and legal risk are significantly affected by user trust and also that the security risk was the biggest negative effect on Fintech adoption intention.

Basis the above understanding and review of existing literature the below mentioned two-step research model was conceptualized using extended TAM model with added independent variables. Perceived usefulness (PU), perceived ease of use (PEOU), perceived social equity (PSE), responsible financial practices (RFP), perceived risk (PR) and trust in fintech providers (TRUST) had been considered as independent variables, where as attitude towards fintech adoption (ATTITUDE) and sustainable financial inclusion (SFI) has been taken as dependent variables.

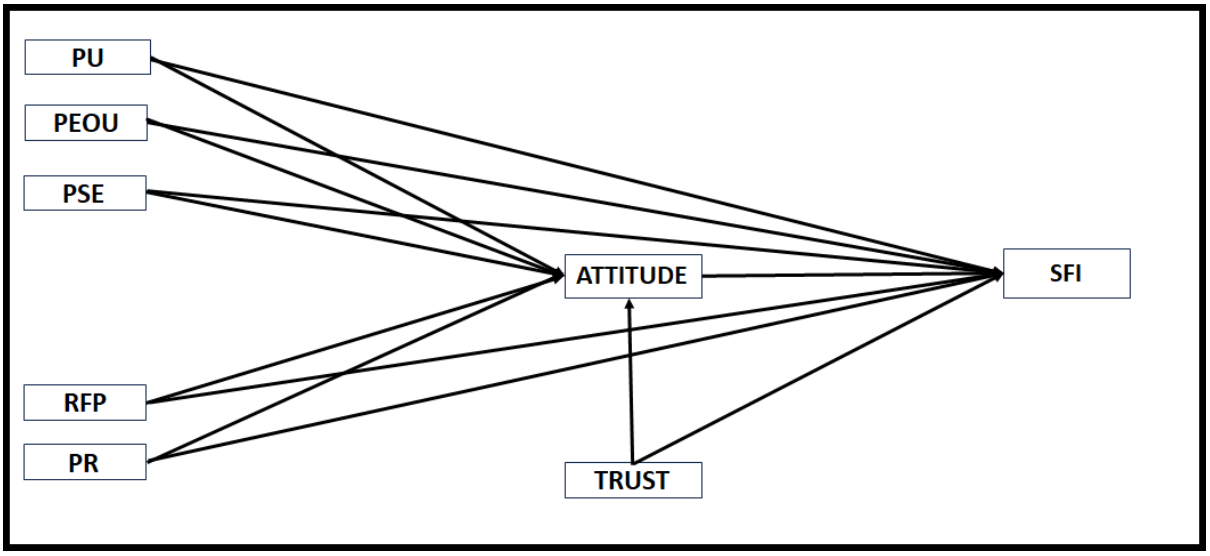

Figure 1. Proposed hypothesised model

Below are the hypotheses based on the research model.

H1: ATTITUDE has a significant impact on SFI.
H2: PU positively influences ATTITUDE.
H3: PEOU positively influences ATTITUDE.
H4: PSE positively influences ATTITUDE.
H5: RFP positively influences ATTITUDE.
H6: PR negatively influences ATTITUDE.
H7: TRUST positively influences ATTITUDE.
H8: PU positively influences SFI.
H9: PEOU positively influences SFI.
H10: PSE positively influences SFI.
H11: RFP positively influences SFI.
H12: PR negatively influences SFI.
H13: TRUST positively influences SFI.

DATA COLLECTION & DATA ANALYSIS

A structured questionnaire with two sections, was designed to collect data. The first section recorded demographic details and the second recorded measurement items (on Likert scale). Responses were collected for the constructs of the hypothesized model. First a pilot study was conducted on 50 respondents from industry and academia and their modifications and suggestions were incorporated in the final questionnaire. Judgmental sampling was used where the majority of respondents were from fields related to fintech, sustainability and financial inclusion. A total of 610 respondents were interviewed and a total of 550 valid responses were accepted and further analysed. Most of respondents were working professionals with 60% (330 respondents out of 550) were from urban areas and the remaining 40% from rural parts of the country. Nearly 70% of the respondents have had a formal education till Class 10 or above whereas the remaining 30% of the respondents have not even passed 10th standard.

DATA ANALYSIS & DISCUSSION

Test of multi-collinearity and common method bias

The data was analysed on SPSS and AMOS software. SPSS was used to check for multi collinearity and common method bias. The multicollinearity of all independent variables was tested using VIF (variance inflation factor) and tolerance. The values for VIF and tolerance for PU were 2.036 and 0.491, respectively. The VIF for PEOU was 2.044, and the tolerance was 0.489. The values for VIF and tolerance of PSE were 1.442 and 0.694, while the VIF and tolerance for RFP were 1.307 and 0.765 respectively. The values for VIF and tolerance of PR were 1.133 and 0.882, and the VIF and tolerance for TRUST were 1.420 and 0.704 respectively. Finally, the VIF for ATTITUDE was 2.233, and the tolerance was 0.448. This demonstrates that there is no case of multicollinearity in the data set, as suggested by James et. al (2013). The VIF of all independent variables fall between 1.133 and 2.233, whereas the values of tolerance for all independent variables lie between the range of 0.488 and 0.882. This is within the accepted value for tolerance which is more than 0.10, and VIF which is less than 10.0 (Pallant, 2020). Further, Harman's single-factor test was used to determine if the total variance extracted by one factor was less than 50% (Podsakoff et. al, 2003). The overall variance was 33.614%, which is considerably less than the 50% criterion advised by Podsakoff et. al (2003) hence, the study has no common method bias.

Construct	Items	Factor Loading	Squared Multiple Correlation	Composite Reliability (CR)	Cronbach Alpha	Average Variance Explained
PU	PU1	0.912	0.833	0.928	0.927	0.811
	PU2	0.92	0.846			
	PU3	0.869	0.756			
PEOU	PEOU1	0.949	0.901	0.936	0.934	0.83
	PEOU2	0.819	0.672			
	PEOU3	0.958	0.918			
PSE	PSE1	0.805	0.649	0.874	0.872	0.7
	PSE2	0.897	0.805			
	PSE3	0.803	0.644			
RFP	RFP1	0.865	0.749	0.914	0.913	0.781

	RFP2	0.943	0.889			
	RFP3	0.84	0.706			
PR	PR1	0.919	0.845	0.844	0.833	0.647
	PR2	0.666	0.443			
	PR3	0.809	0.654			
TRUST	TRUST1	0.724	0.524	0.843	0.838	0.642
	TRSUT2	0.826	0.682			
	TRSUT3	0.849	0.721			
ATTITUDE	ATT1	0.903	0.816	0.945	0.944	0.851
	ATT2	0.94	0.883			
	ATT3	0.924	0.853			
SFI	SFI1	0.924	0.853	0.881	0.88	0.714
	SFI2	0.772	0.596			
	SFI3	0.832	0.692			

Table 1: Measurement model analysis: Reliability and Validity

Test of reliability and validity of research model

Further the hypothesized model was examined using two-step structural equation modelling (SEM). At first, the reliability and validity of constructs were examined using confirmatory factor analysis (CFA). The outcomes of CFA indicate the goodness of fit (GOF) of the data. The reliability and validity of questionnaire items are reported in Table 1. Cronbach alpha scores (Table 1) for PU, PEOU, PSE, RFP, PR, TRUST, ATTITUDE and SFI has been 0.927, 0.934, 0.872, 0.913, 0.833, 0.838, 0.944 and 0.880 respectively. The Cronbach alpha score of all items range between 0.833 and 0.944, which is higher than the recommended value of 0.7, indicating acceptable internal consistency (Hair et. al, 2010) (Tenenhaus et. al, 2005). For establishing convergent validity, three components, factor loading, composite reliability (CR), and average variance explained (AVE), are considered and are reported in Table 1. Factor loadings for PU, PEOU, PSE, RFP, PR, TRUST, ATTITUDE and SFI meet the suggested level of 0.6 or higher (Hair et. al, 2010), and range between 0.666 and 0.958. CR values for all constructs range between 0.843 to 0.945, which again meets the standard value of 0.6 or above. The values of AVE for all the constructs lie within the range of 0.642 to 0.851, which also confirms the acceptance criterion of convergent validity (Hair et. al, 2010). All these important observations are reported in Table 1. The AVE and squared correlation between the constructs were used to determine discriminant validity and are reported in Table 2 and, the squared root of AVE for all constructs range between 0.801 to 0.922, which was greater than the squared correlation between the constructs, suggesting that the constructs used in the analysis met an agreed-upon criterion for discriminant validity (Fornell, 1981).

	MSV	MaxR(H)	PU	PEOU	PSE	RFP	PR	TRUST	ATTITUDE	SFI
PU	0.342	0.931	**0.901**							
PEOU	0.352	0.957	0.585***	**0.911**						
PSE	0.214	0.886	0.424***	0.403***	**0.836**					
RFP	0.15	0.93	0.388***	0.196***	0.258***	**0.884**				
PR	0.089	0.891	-0.190***	-0.198***	-0.143**	-0.086†	**0.805**			
TRUST	0.199	0.853	0.372***	0.389***	0.279***	0.267***	-0.220***	**0.801**		
ATTITUDE	0.352	0.947	0.548***	0.594***	0.462***	0.354***	-0.299***	0.446***	**0.922**	
SFI	0.127	0.905	0.293***	0.346***	0.156**	0.179***	-0.161***	0.239***	0.357***	**0.845**

Table 2. Discriminant Validity

Analysis of hypothesized model

The GOF statistics were analysed to assess the overall predicting power of the model (x2 = 520.572, x2/df = 2.324, Adjusted Goodness-of-Fit Index = 0.901, Normed Fit Index = 0.949, Tucker-Lewis Index = 0.963, Comparative Fit Index = 0.970, and Incremental Fit Index = 0.970, Relative Fit Index = 0.937) which showed a reasonably fit data set. Furthermore, the RMSEA value (0.049) and SRMR value (0.044) are less than the recommended guideline of 0.06 and 0.08 respectively. The PClose value of 0.597 is more than the recommended value of 0.05. Further, the observations indicate that the ATTITUDE positively influences the SFI (β = 0.169, p = .00, and t = 3.506). Similarly, PU (β = 0.155, p = .00, and t = 3.603) and PEOU (β = 0.277, p = .00, and t = 8.513) positively influences the ATTITUDE. Also, it was observed that PSE (β = 0.193, p = .00, and t = 5.372), RFP (β = 0.146, p = .00, and t = 4.255) and TRUST (β = 0.169, p = .00, and t = 4.760) positively affects the ATTITUDE. It was also observed that PR (β = -0.171, p = .00, and t = -4.750) negatively affects ATTITUDE. Thus, it was concluded that the hypotheses H1, H2, H3, H4, H5, H6, H7 stands supported. But PU, PSE, RFP, PR and TRUST do not have any direct effect on SFI since the p value is greater than 0.05. Hence, hypotheses H8, H10, H11, H12 and H3 stands rejected and not supported. But PEOU has a direct significant effect on SFI (β = 0.14, p = .00, and t = 3.585). Hence, this suggests a case of mediation by ATTITUDE on PEOU and SFI. These observations are reported in table 3.

Analysis of mediation

To further investigate, the relationship between PEOU and dependent variable SFI, in presence of mediating variable ATTITUDE bootstrapping was performed (number of bootstrap samples=5000, Bias-corrected confidence interval level= 90). The direct effects of PEOU on SFI were 0.153 whereas the indirect effects of PEOU on SFI were 0.102 taking the total effect of PEOU on SFI to 0.255. Also, it was revealed that both the lower bounds (0.199) and the upper bound (0.309) are positive and the two-tail p value was 0.000 suggesting that the indirect effects are significant. Since, both direct effects and the indirect effects between PEOU and SFI are significant it can be concluded that

there is a case of partial mediation. Hence, H9 stand supported suggesting partial mediation.

Construct	Path			Estimate	S.E.	C.R.	*P* value	Results
H1	SFI	<---	ATTITUDE	0.169	0.048	3.506	***	Supported
H2	ATTITUDE	<---	PU	0.155	0.043	3.603	***	Supported
H3	ATTITUDE	<---	PEOU	0.277	0.033	8.513	***	Supported
H4	ATTITUDE	<---	PSE	0.193	0.036	5.372	***	Supported
H5	ATTITUDE	<---	RFP	0.146	0.034	4.255	***	Supported
H6	ATTITUDE	<---	PR	-0.171	0.036	-4.75	***	Supported
H7	ATTITUDE	<---	TRUST	0.169	0.036	4.76	***	Supported
H8	SFI	<---	PU	0.055	0.049	1.111	0.266	Rejected
H9	SFI	<---	PEOU	0.14	0.039	3.585	***	Supported (Partial mediation)
H10	SFI	<---	PSE	-0.075	0.042	-1.793	0.073	Rejected
H11	SFI	<---	RFP	0.048	0.04	1.215	0.224	Rejected
H12	SFI	<---	PR	-0.053	0.042	-1.272	0.203	Rejected
H13	SFI	<---	TRUST	0.053	0.041	1.295	0.195	Rejected

Table 3: Structural Model: Hypotheses Result

Note: *** = p

CONCLUSION

The study was undertaken to investigate the impact of attitude towards fintech adoption on sustainable financial inclusion in the extended TAM model, testing the relationships between the independent variables perceived usefulness, perceived ease of use, perceived social equity, responsible financial practices, perceived risk, trust in fintech providers and dependent variables attitude towards fintech adoption and sustainable financial inclusion. The study revealed that attitude towards fintech adoption has a significant positive effect on the sustainable financial inclusion of a population. It was also revealed that perceived usefulness, perceived ease of use, perceived social equity, responsible financial practices and trust in fintech providers have a significant positive impact on the attitude towards fintech adoption. It also revealed that perceived risk negatively impacts the attitude towards fintech adoption. These are in concurrence with the earlier studies undertaken with similar objectives (Park & Mercado, 2016; Kim et. al, 2019; Shin & Choi, 2019). Further the study revealed that perceived usefulness has both a direct and indirect positive impact on sustainable financial inclusion. This suggests that convenience to use a fintech platform will be adopted more easily than other fintech platforms. It can be concluded that the adoption of a fintech platform increases the sustainable financial inclusion of its users. Also, the findings suggests that the usefulness and convenience of a fintech platform results in its early adoption and further increasing the sustainable financial inclusion of its users. A fintech that is useful and easy to use shall be easily adopted and shall help bring more people within the sustainable financial bracket. The study has revealed that the adoption of a particular financial technology is highly dependent on its actual usefulness and convenience to use, where convenient fintech shall always be preferred. Furthermore, the results demonstrate that a fintech which is more responsible and socially equitable shall be preferred. Trust and risk also play a very important role in the adoption of a fintech technology. A trust worthy fintech is likely to be adopted by the people whereas risk has a direct significant negative impact on the attitude towards adoption of a Fintech. People have shown considerable concern for sustainability by preferring a responsible and trust worthy fintech.

These findings could significantly contribute to the research in the area of fintech, sustainability and financial inclusion. Also, these findings shall add to the literature on the TAM model and confirm its applicability in the context of fintech and technology. The results may help in policy and strategy formulation in accordance to united nations sustainable development goals and world bank financial inclusion initiatives. These findings shall also help fintech firms in developing their platforms suitable for better and faster adoption that may also help in bridging the financial gap and increase financial sustainability. The major limitation of this study us that the effects of demographic characteristics like gender, income level, financial literacy, living conditions are yet to be studied and its global generalization cannot be assured without taking into account similar studies in different geographies.

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