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Digital Financial Readiness as a Behavioural Enabler of MaaS Adoption in Rural India: A Hybrid PLS-SEM–ANN Approach

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Abstract— *The successful adoption of MaaS platforms, especially in rural and semi-urban areas of developing economies is also a function of users' digital financial preparedness, when coupled with transport integration. As Mobility as a Service (MaaS) is based on smartphone applications, digital payments and trust across the ecosystem, financial inclusion and the digital behaviour stand out as enabling dimensions of mobility inclusion. The present study explores the impact of digital financial readiness on MaaS adoption readiness in rural India via a mediating interplay of financial attitude and financial behaviour. A quantitative research design was used and primary data were collected with structured questionnaires from 220 rural participants. To examine the hypothesised relationships, Partial Least Squares–Structural Equation Modelling (PLS-SEM) was applied before a Multilayer Perceptron (MLP) neural network to evaluate predictive validity and non-linear effects. The results indicate that digital infrastructure influences financial attitude, which further positively influences financial behaviour; the latter also mediates readiness towards MaaS adoption. Financial behaviour was found to be the significant and strongest direct predictor indicating a critical role of enablement in digital mobility systems participation through financial capability. All other antecedents including awareness of fintech, financial knowledge, financial literacy, perceived ease of use, perceived usefulness, self-efficacy, social influence and trust were not statistically significant.The hybrid PLS-SEM–ANN framework has high explanatory and predictive capacity, showing that financial behaviour is a key driver of mobility inclusion. The findings provide implications to policymakers and MaaS providers to establish equitable smart mobility solutions by reinforcing rural digital infrastructure while enabling sustained financial behavioural commitment.*

Keywords: *FinTech adoption, financial inclusion, financial behaviour, digital infrastructure, PLS-SEM, neural networks.*

I. INTRODUCTION

Financial inclusion is at the very centre of economic development, and it is even more important in a country like India, where a massive number of people live in rural areas. It is not just a matter of opening a bank account but also accessing affordable and timely financial services that can help reduce poverty, ensure regular income, empower women, and promote development in general. Even with massive government schemes like Jan Dhan Yojana, digital payments, and fintech, rural areas are struggling to access even basic financial services. A large number of rural households have bank accounts, but people do not use them much or the accounts remain unused, which indicates that mere access is not sufficient for financial inclusion. Financial attitudes and behaviours of people, influenced by their economic conditions, trust in technology, and financial literacy, play a significant role in determining whether they actually use financial services or not. If we ignore the behaviour aspect, technology may provide only superficial inclusion. Therefore, understanding financial attitudes and behaviours is essential for developing inclusive and technology-driven financial systems. This study examines the same in a descriptive manner, specifically for rural households.

II. LITERATURE REVIEW

FinTech Awareness:

FinTech awareness essentially captures the degree to which people are aware of digital financial innovations (Arner, et al., 2015). The authors describe the concept that people's awareness of fintech developments drives their behaviour. Finally, Thakor & V., (2020) highlights the importance of

awareness, not only because it builds trust but also because it leads to continued use, implying that informed consumers are more likely to adopt fintech-enabled banking services.

H1: FinTech Awareness has a significant positive effect on Financial Attitude.

Financial knowledge:

Financial knowledge refers to the knowledge of financial concepts and instruments (Hilgert, et al., 2003). It is very important for financial management. It helps in the application of financial knowledge and ideas in people's daily financial activities (Falahati, et al., 2012). There is a very strong relationship between financial knowledge and financial capability, and people with higher financial knowledge have more confidence and ability to manage their finances (Bhargava, et al., 2022). Financial knowledge is also a very important part of financial literacy. It helps people comprehend and utilize the knowledge gained about finance in order to make proper decisions (Huston & J., 2010). In addition, proper knowledge in finance allows an individual to compare various financial decisions, thus enabling proper decisions, which improve their well-being financially (Lusardi & A., 2012).

H2: Financial knowledge has a significant positive effect on Financial Attitude.

Financial Literacy:

As described by Lusardi, et al., (2011), financial literacy is best described as "being able to comprehend financial concepts as well as having the motivation, as well as confidence, needed to apply this understanding in order to have informed decisions in particular situations." Financial markets participation by individuals is largely influenced by financial literacy and knowledge, as such knowledge enables them to make informed decisions regarding investments (Rooij, et al., 2011). More recent studies have confirmed that literacy affects the financial behavior of individuals (Grohmann & A., 2018).

H3: Financial Literacy has a significant positive effect on Financial Attitude.

Perceived Ease of Use: Perceived ease of use is the effort an individual perceives to use a technology (Davis, D., & F., 1989). User-friendly tech influences the way in which people perceive technology. This technology makes systems appear more useful since they are less effort-intensive (Venkatesh & V., 2000). Additionally, user-friendly systems increase customer satisfaction with technology, as simple and friendly systems are more accepted (Wang, et al., 2003). Ease of use is identified as a factor that influences the intention to use the technology (Baba, O., Muhammad, Z., & M., 2012).

H4: Perceived Ease of Use has a significant positive effect on Financial Attitude.

Perceived Usefulness:

Perceived usefulness refers to the extent to which a system enhances one's performance (Davis, D., & F., 1989). Perceived usefulness is a factor that has a great influence on the intention to use technology. Individuals are more likely to use technology if they feel that it will enhance their performance and efficiency (Venkatesh, V., Davis, & D., 2000). In the banking sector, perceived usefulness is significant in the adoption of internet banking (Cheng, et al., 2006). Additionally, Cheah, et al., (2011) explains that perceived usefulness is significant in the adoption of mobile banking. Karthik Ram and Selvabaskar (2023) found that the intention to use mobile payment systems among unorganised retailers is significantly influenced by perceived usefulness, ease of use, and trust. The study also highlights that behavioural intention plays a crucial role in driving actual adoption of digital payment systems in informal retail settings.

H5: Perceived Usefulness has a significant positive effect on Financial Attitude.

Self-efficacy:

Self-efficacy refers to an individual's belief in their ability to perform a task well (Bandura, 1997). Self-efficacy is important in the application of technology. If individuals have confidence in their capabilities, they are more likely to attempt and apply technology systems (Compeau, R., Higgins, & A., 1995). In finance, financial self-efficacy increases confidence and improves financial decision-making, enabling individuals to manage their finances effectively (Lown & M., 2011).

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H6: Self-efficacy has a significant positive effect on Financial Attitude.

Trust:

Trust is defined as the belief that the other person will behave in a responsible manner and will not take advantage of your weaknesses in online transactions. Trust is an important consideration for the adoption of digital financial services. Institutional trust is identified as a major factor for initial acceptance of technology-driven financial services (McKnight, et al., 2002). In electronic transactions, trust is identified as a factor that increases the intention to use digital services by alleviating concerns about security and privacy (Pavlou & A., 2003). Trust is identified as a factor for adopting mobile banking services in developing countries (Zhou & T., 2012).

H7: Trust has a significant positive effect on Financial Attitude.

Social Influence:

Social influence refers to the perceived pressure from significant others to adopt and use technology (Venkatesh, et al., 2003). Normative beliefs affect people's intentions to use tech by illustrating what they believe others expect about the use of technology (Douglass & B., 1977). Moreover, other people affect the adoption of technology because individuals tend to observe what others say in their social networks when they are considering adopting new technology (Taylor, S., Todd, & A., 1995).

H8: Social Influence has a significant positive effect on Financial Attitude.

Digital Infrastructure:

Digital infrastructure is a prerequisite for the provision of digital financial services (Group, 2016). Digital infrastructure is a critical enabler of the spread and use of FinTech because it enables access to digital platforms and financial technologies (Organisation for Economic Co-operation and Development (OECD), 2019). In particular, the extension of mobile infrastructure is an important enabler of access to financial services, particularly in developing regions, because it reduces distance and information costs of access to finance (Aker, C., Mbiti, & M., 2010). On the other hand, Aggarwal, et al., (2014) lists inadequate infrastructure as one of the major hindrances in rural areas.

H9: Digital Infrastructure has a significant positive effect on Financial Attitude.

Financial Attitude:

Furnham, et al., (1984) explains financial attitude of a person can be stated as what they believe and think regarding managing finances also he found that financial attitudes play an important role in determining the way people save or spend money. Mien, et al., (2015), also emphasizes that financial attitude plays an important role in determining the way people manage their finances.

H10: Financial Attitude has a significant positive effect on Financial Behaviour.

Financial Behaviour:

According to Hilgert, et al., (2003), financial behaviour is the way in which people use money. Budgeting, saving, borrowing, and investing money are also included in this and he also illustrates that there is a relationship between what people know and what they do. Fernandes, et al., (2014) concludes that good behaviour results in good financial outcomes. Lusardi, et al., (2014) asserts that prudent financial behaviour minimizes exposure to financial disturbances. Ram et al. (Ram, 2026), found that customer satisfaction in mobile payment platforms is significantly influenced by perceived usefulness, ease of use, and trust, which collectively enhance user experience.

H11: Financial Behaviour has a significant positive effect on Financial Inclusion.

Financial Inclusion:

It is related to financial products that create opportunities for both businesses and individuals to gain access to valuable financial products that are financially inclusive. Financial inclusion enables all people to gain access to formal financial services. Therefore, it involves ensuring that all people gain access to formal financial services. (Demirguc-Kunt, et al., 2018). Digital financial services contribute more people in developing countries accessing the formal financial sector (Allen, et al., 2016). Households manage their finances in a more

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stable manner through financial inclusion (Sarma, M., Pais, & J., 2011). Technology-based solutions can enhance financial inclusion (Ozili & K., 2018). Digital technology has made it possible for people living in rural areas and low incomes earners to access financial services (Gabor, D., & Brooks, 2020).

CONCEPTUAL FRAMEWORK

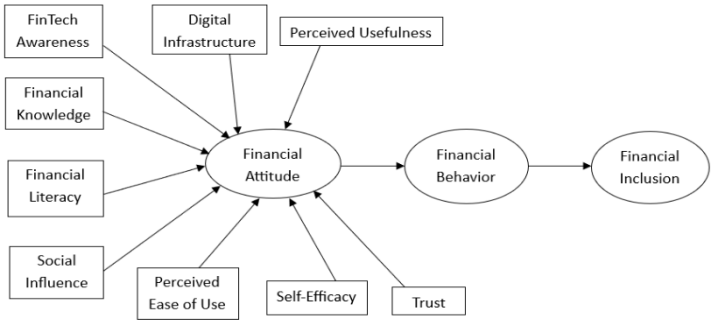

Fig. 1 Conceptual framework

III. METHODOLOGY

The research design that was adopted in this study was cross-sectional, and it was quantitative in nature. This was because the study aimed to investigate the factors that influence financial attitude, financial behaviour, and financial inclusion. The study employed a structured questionnaire to collect primary data from rural communities who can access digital financial services, and it obtained a total of 220 responses. The questionnaire items for all constructs—financial literacy, financial knowledge, fintech awareness, perceived usefulness, perceived ease of use, trust, social influence, digital infrastructure, and self-efficacy—were adapted from existing scales and administered using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). All constructs were modelled as reflective. The proposed framework was assessed using Partial Least Squares-Structural Equation Modelling (PLS-SEM) with SmartPLS. This technique is particularly suited to complex models, predictive purposes, and non-normal data with moderate sample sizes. The measurement model was assessed for internal consistency reliability, indicator reliability, convergent validity, and discriminant validity using composite reliability, outer loadings, average variance extracted (AVE), and Fornell-Larcker criterion. The structural model was assessed using collinearity (VIF), coefficient of determination (R^2), path significance through bootstrapping with 5,000 resamples, and predictive relevance through blindfolding (Q^2).

IV. FINDINGS OF PLS-SEM

Construct reliability and Validity:

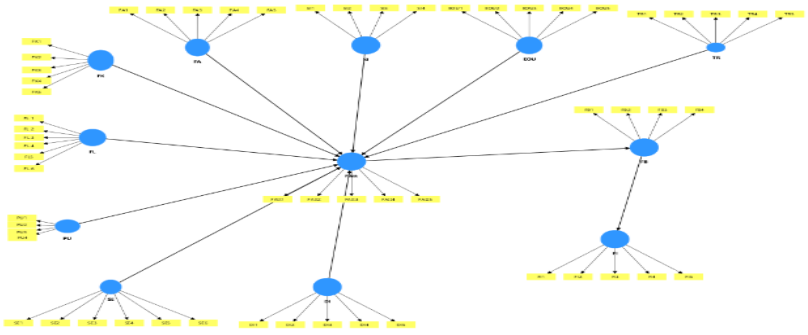

Fig. 2 Structural Equation Model (SEM) Path Diagram

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The findings of the evaluation of the measurement model show that all constructs have satisfactory internal consistency reliability and convergent validity. In this case Cronbach's alpha values fall between 0.810 and 0.921 which is above the cut-off point of 0.70 hence it can be said that the constructs have good internal consistency reliability. It can be seen that the composite reliability coefficients for both ρa and ρc are all higher than 0.70 for each construct, ranging from 0.826 to 0.941 for construct measurements (Hair, et al., 2011).

This is further confirmed by the Convergent Validity as the values of average variance extracted (AVE) for all the constructs are above than 0.50, their values range from 0.578 to 0.761. These shows that each construct clarifies more than fifty percent of variance in their indicators. On the whole, these results confirm that the measurement model possesses good reliability and convergent validity and it can be used for conducting further structural equation modelling analysis system.

*DI – Digital Infrastructure; EOU – Perceived Ease of Use; FA – FinTech Awareness; FAtt – Financial Attitude; FB – Financial Behaviour; FI – Financial Inclusion; FK – Financial Knowledge; FL – Financial Literacy; PU – Perceived Usefulness; SE – Self-efficacy; SI – Social Influence; TR – Trust.

Table 1 Construct reliability and Validity

Description	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
DI	0.866	0.876	0.903	0.652
EOU	0.816	0.848	0.871	0.578
FA	0.897	0.914	0.924	0.710
FAtt	0.921	0.923	0.941	0.761
FB	0.850	0.857	0.901	0.696
FI	0.867	0.870	0.904	0.655
FK	0.837	0.866	0.884	0.605
FL	0.869	0.885	0.901	0.604
PU	0.815	0.830	0.877	0.641
SE	0.896	0.903	0.920	0.658
SI	0.810	0.826	0.874	0.636
TR	0.893	0.899	0.921	0.699

Discriminant validity:

HTMT Matrix:

The discriminant validity was further confirmed with the HTMT ratio known as the Heterotrait–Monotrait (HTMT). The results show that all HTMT values are below the suggested threshold of 0.90, with values vary between 0.496 and 0.889. By doing this we imply that constructs are underlined in an independent way and it is recommended to have inter-construct discriminant validity (Hair, et al., 2011). None of the pair of constructs exceed the threshold value which indicates that there are no issues regarding to the discriminant validity for measurement model.

Table 2 Heterotrait – Monotrait (HTMT) Matrix

Description	DI	EOU	FA	FAtt	FB	FI	FK	FL	PU	SE	SI
DI											
EOU	0.827										
FA	0.726	0.614									
FAtt	0.822	0.820	0.595								
FB	0.671	0.763	0.555	0.639							
FI	0.715	0.815	0.601	0.733	0.816						
FK	0.719	0.689	0.829	0.685	0.705	0.616					
FL	0.773	0.876	0.697	0.761	0.679	0.718	0.761				
PU	0.784	0.879	0.757	0.828	0.677	0.729	0.824	0.819			
SE	0.849	0.801	0.710	0.809	0.698	0.603	0.811	0.795	0.833		
SI	0.808	0.814	0.645	0.775	0.833	0.822	0.718	0.777	0.772	0.795	
TR	0.861	0.889	0.496	0.810	0.736	0.682	0.637	0.750	0.833	0.878	0.762

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ES (2026) 22, 4(S), 31-42 ISSN:1505-4683

Fornell-Larcker criterion:

Validity discrimination was tested using the Fornell–Larcker criterion. The results indicate that, for each construct, the square root of the average variance extracted (AVE) is higher than the inter-construct correlations that it has with other constructs. This tells us that each construct exhibits a greater correlation between its own measures than with those of any other construct in the model. Consequently, the findings verify that all constructs are indeed empirically different and therefore validity discrimination was sufficiently satisfied as per recommendations (Hair, et al., 2011).

Table 3 Fornell-Larcker criterion

Description	DI	EOU	FA	FAtt	FB	FI	FK	FL	PU	SE	SI	TR
DI	**0.808**											
EOU	**0.708**	**0.760**										
FA	**0.653**	**0.541**	**0.843**									
FAtt	**0.739**	**0.732**	**0.550**	**0.872**								
FB	**0.571**	**0.632**	**0.475**	**0.568**	**0.834**							
FI	**0.613**	**0.681**	**0.525**	**0.653**	**0.702**	**0.809**						
FK	**0.623**	**0.592**	**0.709**	**0.618**	**0.594**	**0.533**	**0.778**					
FL	**0.698**	**0.766**	**0.606**	**0.698**	**0.579**	**0.626**	**0.654**	**0.777**				
PU	**0.676**	**0.733**	**0.655**	**0.736**	**0.566**	**0.612**	**0.696**	**0.699**	**0.801**			
SE	**0.755**	**0.787**	**0.640**	**0.741**	**0.606**	**0.530**	**0.716**	**0.715**	**0.810**	**0.811**		
SI	**0.693**	**0.762**	**0.575**	**0.683**	**0.691**	**0.682**	**0.613**	**0.671**	**0.639**	**0.688**	**0.798**	
TR	**0.752**	**0.765**	**0.446**	**0.740**	**0.643**	**0.603**	**0.566**	**0.672**	**0.719**	**0.787**	**0.654**	**0.836**

*DI – Digital Infrastructure; EOU – Perceived Ease of Use; FA – FinTech Awareness; FAtt – Financial Attitude; FB – Financial Behaviour; FI – Financial Inclusion; FK – Financial Knowledge; FL – Financial Literacy; PU – Perceived Usefulness; SE – Self-efficacy; SI – Social Influence; TR – Trust.

Collinearity:

All the VIF statistics are less than 5.0, there is no multicollinearity to be concerned with in this model. This means that predictor constructs demonstrate zero convergent validity and their overlap is ruled out, each construct plays a unique role in explanation of the endogenous constructs. Consistent with Hair, et al. (2011), there should be none of those problems which might cause the path coefficients unstable, the standard errors biased upward, or the structural model results misleading to debunk collinearity and other related assumptions.

R-square:

Table 4 R-square

Description	R-square	R-square adjusted
FAtt	0.697	0.666
FB	0.323	0.316
FI	0.493	0.488

*FAtt – Financial Attitude; FB – Financial Behaviour; FI – Financial Inclusion.

The model was tested for its explanatory power using the coefficient of determination (R^2). These results show that the model, on the one hand, explains 69.7% of variance in Financial Attitude ($R^2 = 0.697$), which is a substantial result. On the other hand, it describes 32.3% of variance in Financial Behaviour ($R^2 = 0.323$) and 49.3% of variance in Financial Intention ($R^2 = 0.493$) which is considered as having moderate explanatory power so it is within the guidelines (Hair, et al., 2011). The adjusted R^2 values also serves to confirm this point further about how strong the model is along with those previous results line up. According to the above results it can be concluded that the given model having satisfactory predictive accuracy towards endogenous constructs.

F-square:

FB is inferred to have an outstandingly enormous influence on FI ($f^2 = 0.973$) and FAtt is found to have a large effect on FB ($f^2 = 0.477$) leads to have these constructs as the main contributors that provide

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ES (2026) 22, 4(S), 31-42 ISSN:1505-4683

good fit in the model. Conversely, DI, PU, and TR have effects that very small on Fatt ($f^2 > 0.02$ but < 0.15) while EOU, FA, FK, FL, SE, and SI have no influence of it ($f^2 < 0.02$). This show their practical significance are also limited. In general, findings reveal that few variables possess the capability of significantly accounting for the explained variance in endogenous variables (Hair, et al., 2011).

Description	DI	EOU	FA	FAtt	FB	FI	FK	FL	PU	SE	SI	TR
DI				0.048								
EOU				0.005								
FA				0.004								
FAtt					0.477							
FB						0.973						
FI												
FK				0.003								
FL				0.012								
PU				0.048								
SE				0.001								
SI				0.016								
TR				0.022								

Table 5 F-square

*DI – Digital Infrastructure; EOU – Perceived Ease of Use; FA – FinTech Awareness; FAtt – Financial Attitude; FB – Financial Behaviour; FI – Financial Inclusion; FK – Financial Knowledge; FL – Financial Literacy; PU – Perceived Usefulness; SE – Self-efficacy; SI – Social Influence; TR – Trust.

V. FINDINGS OF BOOTSTRAPPING

Path coefficients:

The bootstrapping outcomes for the structural model imply that there are just few statistically significant direct relationships. DI to Financial Attitude (FAtt) is a positive and significant one ($\beta = 0.228$, $t = 2.115$, $p = 0.034$). It means that DI has an important role in shaping Financial Attitude. In addition to this, FAtt → FB is also realized direct relationship (Beta=0.568; T=6.210; P<0.001) as well as FB → FI direct relationship (beta-0.702; T=11.425; P<0.001).

On the contrary, paths into Financial Attitude from EOU, FA, FK, FL, PU, SE, SI and TR are not statistically significant ($p > 0.05$), which means that these antecedent variables do not possess a direct significant effect in terms of Financial Attitude. As a whole the findings propose that Financial Attitude as well as Financial Behaviour come up to be the principal direct predictors in the structural model while the other constructs fail to show significant direct effects.

Table 6 Path coefficients

Description	Hypothesis	T statistics (|O/STDEV|)	P values
DI -> FAtt	H9	2.115	0.034
EOU -> FAtt	H4	0.628	0.53
FA -> FAtt	H1	0.55	0.582
FAtt -> FB	H10	6.21	0
FB -> FI	H11	11.425	0
FK -> FAtt	H2	0.456	0.648
FL -> FAtt	H3	1.104	0.27
PU -> FAtt	H5	1.277	0.202
SE -> FAtt	H6	0.231	0.817
SI -> FAtt	H8	1.144	0.253
TR -> FAtt	H7	1.583	0.113

*DI – Digital Infrastructure; EOU – Perceived Ease of Use; FA – FinTech Awareness; FAtt – Financial Attitude; FB – Financial Behaviour; FI – Financial Inclusion; FK – Financial Knowledge; FL – Financial Literacy; PU – Perceived Usefulness; SE – Self-efficacy; SI – Social Influence; TR – Trust.

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ES (2026) 22, 4(S), 31-42 ISSN:1505-4683

Specific indirect effects:

The bootstrapping results on the specific indirect effects point out that only a limited number of mediations are statistically significant. DI indirectly impacts FB through FAtt is significant (β = 0.129, t = 2.179, p = 0.029). Thus, Financial Attitude is a mediator in the relationship between DI and FB. Similarly, it also occurs on the FAtt to FI via FB (β = 0.399, t = 4.513, p < 0.001), showing a mediation effect of Financial Behaviour. Furthermore, the serial mediation path DI → FAtt → FB → FI is found to be significant as well (β = 0.091, t = 2.099, p = 0.036). There is no mediation for any other indirect effects (p > .05). This confirms partial mediation in the proposed model (Hair, et al., 2011).

Table 7 Specific indirect effects

Description	Standard Deviation (STDEV)	T statistics (|O/STDEV|)	P values
DI -> FAtt -> FB	0.059	2.179	0.029
EOU -> FAtt -> FB	0.074	0.613	0.540
FA -> FAtt -> FB	0.057	0.542	0.588
FAtt -> FB -> FI	0.088	4.513	0.000
FK -> FAtt -> FB	0.063	0.445	0.656
FL -> FAtt -> FB	0.052	1.134	0.257
PU -> FAtt -> FB	0.103	1.286	0.198
SE -> FAtt -> FB	0.085	0.226	0.821
SI -> FAtt -> FB -> FI	0.045	1.033	0.301
TR -> FAtt -> FB -> FI	0.046	1.414	0.157
EOU -> FAtt -> FB -> FI	0.054	0.590	0.555
SI -> FAtt -> FB	0.061	1.088	0.277
DI -> FAtt -> FB -> FI	0.043	2.099	0.036
TR -> FAtt -> FB	0.062	1.496	0.135

*DI – Digital Infrastructure; EOU – Perceived Ease of Use; FA – FinTech Awareness; FAtt – Financial Attitude; FB – Financial Behaviour; FI – Financial Inclusion; FK – Financial Knowledge; FL – Financial Literacy; PU – Perceived Usefulness; SE – Self-efficacy; SI – Social Influence; TR – Trust.

Neural Network Analysis:

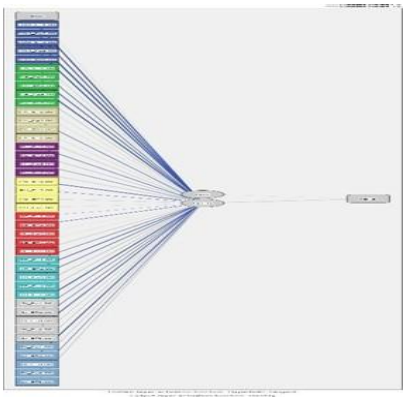

Fig. 3 Neural Network

A multilayer perceptron (MLP) neural network model was employed to determine the predictive capability of the proposed model on financial behaviour (FB_E). During training, the sum of squares error (SSE) of 24.347 with a relative error of 0.477 indicated that the network was able to decrease the errors of prediction. During testing, the SSE decreased to 12.641 with a relative error of 0.582, which indicated that the network generalized fairly well to new data. The small difference between the SSE values of training and testing data

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ES (2026) 22, 4(S), 31-42 ISSN:1505-4683

indicated that there is no significant overfitting and the network maintains a consistent level of predictive accuracy on all samples. The training process was automatically stopped when there was one step with no further improvement in the error, which ensured that the training process had good convergence without any unnecessary iterations. The error results indicate that the neural network model has moderate to good predictive power for financial behaviour outcomes, which verifies the nonlinear relationships among the variables in the study.

Table 8: summary of neural network

Training	Sum of Squares Error	24.347
	Relative Error	.477
	Stopping Rule Used	1 consecutive step(s) with nc decrease in error
	Training Time	0:00:00.01
Testing	Sum of Squares Error	12.641
	Relative Error	.582

Dependent Variable: FB_E

VI. DISCUSSION

Overall, this study concludes that in the context of rural applications, digital infrastructure serves as a prerequisite for enabling MaaS adoption readiness. The significant relationship between Digital Infrastructure (reliable internet connectivity, smartphone compatibility and accessible digital systems) and Digital Financial Attitude (β = 0.228, p= 0.034) implies positive perceptions toward financial digital platforms prevalent in MaaS ecosystems are governed by the interconnectedness to infrastructure elements like reliable worldwide web connectivity and mobile accessibility. Infrastructure readiness alone does not translate directly into adoption of MaaS, but influences it through behavioral mechanisms. Digital Financial Attitude positively influenced on Digital Mobility Behavior (β = 0.568, p < 0.001), that is when individuals' attitude towards digital finance is relatively high, the active participation in behaviors of payment through applications will be further positively promoted. Most importantly, Digital Mobility Behavior was the best-performing predictor of MaaS Adoption Readiness (β = 0.702, p < 0.001; f^2 = 0.973), confirming that engagement with digital transactions forms the key behavioral basis for rural participation in integrated mobility platforms. It was interesting to note that constructs like fintech awareness, financial knowledge, financial literacy, perceived ease of use, perceived usefulness, trust and social influence did not have significant direct effects on Digital Financial Attitude in this study. This suggests that compared to urban settings, MaaS readiness in rural settings is less correlated with perceptual or cognitive factors and more dependent on formal infrastructural access and habitual digital behavior. The notable sequential mediation pathway exhibits (β = 0.091, p = 0.036) provides additional evidence that MaaS adoption results from a stepwise behavioral chain in which infrastructure influences attitude, attitude leads to behavior and finally, the gained behavior β is accumulated towards participation in mobility platforms. Results from the neural network add support for this interpretation as predictive performance remained constant, suggesting that MaaS readiness is more a function of behavior and nonlinear in nature. The results imply that the wider provision of digital mobility services in a rural context should focus on reliability of infrastructural provisions and continuity rather than extending simple coverage or promotion.

VII. CONCLUSION

This segmentation study modelled the behavioral determinants that impact MaaS adoption readiness in rural India using a hybrid data analysis approach, combining PLS- SEM and ANN models linking the latent digital financial readiness variables. The results show that the participatory basis of MaaS is fundamentally based on behavior rather than

perception. So, Digital Infrastructure was the strong enabler of Digital Financial Attitude which in turn affected Digital Mobility Behavior. Most significantly, Digital Mobility Behavior was revealed to be the strongest predictive factor of MaaS Adoption Readiness — confirming that ongoing interaction with digital payment systems is at the heart of a successful inclusive mobility ecosystem. The strong sequential mediation pathway further confirms that infrastructure on its own is not enough, and the effect happens through attitudinal change and behavioral activation. The non- significant effects of itself suggests that guided interventions based on awareness may not work as effectively in ensuring fintech adoption in rural areas unless they are accompanied by improvements in the reliability of systems and opportunity for behavioral engagement. Additionally, the analysis from complementary neural networks further supports such findings on behavioral factors while simultaneously validating the proposed model.

In summary, this paper adds to the increasing body of MaaS literature by moving constructs of financial inclusion into the field of digital mobility and providing empirical proof that classical behavioral forms of financial engagement are a foundational element for rural MaaS readiness. These results point out that for policy makers and MaaS operators, more attention needs to be paid to address the digital infrastructural development and reinforce behaviors, so as to present inclusive, equitable and sustainable smart mobility ecosystems.

REFERENCE

1. Aggarwal, & R. (2014). Financial inclusion in India: Challenges and opportunities. *International Journal of Research*, 557-567.
2. Ajzen, & I. (1991). The theory of planned behavior. *Organizational behavior and human decision processes*, 179-211.
3. Aker, C., J., Mbiti, & M., I. (2010). Mobile phones and economic development in Africa. *Journal of economic Perspectives*, 207-232. doi:10.1257/jep.24.3.207
4. Allen, F., Demirguc-Kunt, A., Klapper, L., Peria, &., & M., M. S. (2016). The foundations of financial inclusion: Understanding ownership and use of formal accounts. *Journal of financial Intermediation*, 1-30. doi:10.1016/j.jfi.2015.12.003
5. Arner, W., D., Barberis, J., Buckley, & P., R. (2015). *The evolution of Fintech: A new post-crisis paradigm.* Hong Kong: University of Hong Kong, Faculty of Law. doi:10.2139/ssrn.2676553
6. Atkinson, A., Messy, A., & F. (2012). *Measuring financial literacy: Results of the OECD/International Network on Financial Education (INFE) pilot study.* Paris, France: OECD Publishing. doi:10.1787/5k9csfs90fr4-en
7. Baba, O., R. I., Muhammad, Z., & M. (2012). An analysis of mobile banking acceptence by Malaysian customers. *Sunway academic journal*, 1-12.
8. Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY, USA: W. H. Freeman and Company.
9. Bhargava, M., Sharma, A., Mohanty, B., . . . M., M. (2022). Moderating role of personality in relationship to financial attitude, financial behaviour, financial knowledge and financial capability. *International Journal of Sustainable Development and Pl.* doi:10.18280/ijsdp.170635
10. Cheah, M., C., Teo, C., A., Sim, J., J., . . . I., B. (2011). Factors affecting Malaysian mobile banking adoption: An empirical analysis. *International Journal of Network and Mobile Technologies*, 149-160.
11. Chen, C., Y., Sun, S., Huang, J., Sherraden, & S., M. (2026). Financial capability and economic well-being of older Americans: Empirical insights from the financial capability framework. *Innovation in Aging*, igag003. doi:10.1093/geroni/igag003
12. Cheng, E., T., Lam, Y., D., Yeung, & C., A. (2006). Adoption of internet banking: an empirical study in Hong Kong. *Decision support systems*, 1558-1572.
13. Compeau, R., D., Higgins, & A., C. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS quarterly*, 189-211. doi:10.2307/249688
14. Davis, D., & F. (1989). Perceived Usefulness, Perceived Ease of Use and User Acceptance of Information Technology. *MIS quarterly*.
15. Davis, D., & F. (1989). Perceived Usefulness, Perceived Ease of Use and User Acceptance of Information Technology. *MIS quarterly*. doi:10.2307/249008
16. DELL'ARICCIA, I., G. I., PENCE, & M., K. (2009). The age of reason: financial decisions over the life cycle and implications for regulation. Comments and discussion.

Brookings Papers on Economic Activity, 102-117. doi:10.1353/eca.0.0067
17. Demirgüç-Kunt, A., Klapper, L., Singer, D., . . . J. (2015). *The Global Findex Database 2014: Measuring Financial Inclusion Around the World.* Washington, DC: World Bank. doi:https://documents1.worldbank.org/curated/en/187761468179367706/pdfyWPS7255.pdf
18. Demirguc-Kunt, A., Klapper, L., Singer, D., . . . J. (2018). The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution. *World Bank Publications*.
19. Demirguc-Kunt, A., Klapper, L., Singer, D., . . . J. (2018). *The Global Findex Database 2017: Measuring financial inclusion and the fintech revolution.* World Bank, 2018. doi:10.1596/978-1-4648-1259-0
20. Douglass, & B., R. (1977). *Belief, attitude, intention, and behavior: An introduction to theory and research.* Reading, MA, USA: Addison-Wesley.
21. Falahati, L., Sabri, F., M., Paim, & H., L. (2012). Assessment a model of financial satisfaction predictors: Examining the mediate effect of financial behaviour and financial strain. *World Applied Sciences Journal*, 190-197. doi:10.5829/idosi.wasj.2012.20.02.1832
22. Fernandes, D., Jr, L., G., J., Netemeyer, & G., R. (2014). Financial literacy, financial education, and downstream financial behaviors. *Management science*, 1861-1883. doi:10.1287/mnsc.2013.1849
23. Foundation, I. B. (n.d.). *Reserve Bank of India's Financial Inclusion Index Shows Growth Across All Segments*. Retrieved from IBEF: https://www.ibef.org/news/reserve-bank-of-india-s-rbi-financial-inclusion-index-shows-growth-across-all-segments-rises-4-3-in-fy25
24. Furnham, & A. (1984). Many sides of the coin: The psychology of money usage. *Personality and individual Differences*, 501-509. doi:10.1016/0191-8869(84)90025-4
25. Furnham, & A. (1984). Many sides of the coin: The psychology of money usage. *Personality and individual Differences*, 501-509.
26. Gabor, D., & Brooks, S. (2020). The digital revolution in financial inclusion: international development in the fintech era. In K. Bayliss, *Material Cultures of Financialisation* (pp. 69-82). Routledge (Taylor & Francis). doi:10.4324/9781351002103-6
27. Gefen, D., Karahanna, E., Straub, & W., D. (2003). Trust and TAM in online shopping: An integrated model. *MIS quarterly*, 51-90.
28. Grohmann, & A. (2018). Financial literacy and financial behavior: Evidence from the emerging Asian middle class. *Pacific-Basin Finance Journal*, 129-143. doi:10.1016/j.pacfin.2018.01.007
29. Group, W. B. (2016). *World development report 2016: Digital dividends.* Washington, D.C., USA: World Bank. doi:10.1596/978-1-4648-0671-1
30. Hair, F., J., Ringle, M., C., Sarstedt, & M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing theory and Practice*, 139-152. doi:10.2753/MTP1069-6679190190202
31. Hilgert, A., M., Hogarth, M., J., Beverly, & G., S. (2003). Household financial management: The connection between knowledge and behavior. *Fed. Res. Bull*, 309. Retrieved from https://www.federalreserve.gov/pubs/bulletin/2003/0703lead.pdf
32. Hilgert, A., M., Hogarth, M., J., Beverly, & G., S. (2003). Household financial management: The connection between knowledge and behavior. *Fed. Res. Bull.*, 89, 309.
33. Hilgert, A., M., Hogarth, M., J., Beverly, &., & G., S. (2003). Household financial management: The connection between knowledge and behavior. *Fed. Res. Bull.*, 309.
34. Huston, & J., S. (2010). Measuring financial literacy. *Journal of consumer affairs*, 296-316. doi:10.1111/j.1745-6606.2010.01170.x
35. Karthik Ram, M., & Selvabaskar, S. (2023). Intention to use mobile payment systems among unorganised retailers in India. *Journal of Payments Strategy & Systems*, 200–222.
36. Lown, & M., J. (2011). Development and validation of a financial self-efficacy scale. *Journal of Financial Counseling and Planning*, 54.
37. Lusardi, & A. (2012). *Numeracy, financial literacy, and financial decision-making (No. w17821).* Cambridge, MA: National Bureau of Economic Research. doi:10.3386/w17821
38. Lusardi, A., Mitchell, & S., O. (2011). Financial literacy and planning: Implications for retirement wellbeing (No. w17078). *National Bureau of Economic Research.*
39. Lusardi, A., Mitchell, & S., O. (2011). Financial literacy and planning: Implications for retirement wellbeing (No. w17078). *National Bureau of Economic Research.* doi:10.3386/w17078
40. Lusardi, A., Mitchell, &., & S., O. (2014). The economic importance of financial literacy: Theory and evidence. *American Economic Journal: Journal of Economic Literature*, 5-44. doi:10.1257/jel.52.1.5
41. McKnight, D. H., Choudhury, V., & Kacmar, C. (2002). Developing and validating trust

measures for e-commerce: An integrative typology. *Information systems research*, 334-359.
42. McKnight, H., D., Choudhury, V., Kacmar, & C. (2002). Developing and validating trust measures for e-commerce: An integrative typology. *Information systems research*, 334-359. doi:10.1287/isre.13.3.334.81
43. Mien, N., N. T., Thao, & P., T. (2015). Factors affecting personal financial management behaviors: Evidence from Vietnam. *Proceedings of the Second Asia-Pacific Conference* (pp. 1–16.). Danang, Vietnam: Asia-Pacific Conference on Global Business, Economics, Finance and Social Sciences (AP15 Vietnam Conference).
44. Ofoeda, I., Amoah, L., Anarfo, B., E., . . . Y., J. (2024). Financial inclusion and economic growth: What roles do institutions and financial regulation play? *International Journal of Finance & Economics*, 832-848. doi:10.1002/ijfe.2709
45. Organisation for Economic Co-operation and Development (OECD). (2019). *Going digital: Shaping policies, improving lives.* Paris, France: OECD Publishing. doi:10.1787/9789264312012-en.
46. Ozili, & K., P. (2018). Impact of digital finance on financial inclusion and stability. *Borsa istanbul review*, 329-340. doi:10.1016/j.bir.2017.12.003
47. Pavlou, & A., P. (2003). Consumer acceptance of electronic commerce: Integrating trust and risk with the technology acceptance model. *International journal of electronic commerce*, 101-134. doi:10.1080/10864415.2003.11044275
48. Ram, M. K. (2026). A theoretical and empirical perspective on customer satisfaction and loyalty in mobile payment platforms. (pp. 1–8). IEEE.
49. Rooij, V., M., Lusardi, A., Alessie, & R. (2011). Financial literacy and stock market participation. *Journal of Financial economics*, 449-472. doi:10.1016/j.jfineco.2011.03.006
50. Sarma, M., Pais, & J. (2011). Financial inclusion and development. *Journal of international development*, 613-628.
51. Sarma, M., Pais, &., & J. (2011). Financial inclusion and development. *Journal of international development*, 613-628. doi:10.1002/jid.1698
52. Taylor, S., Todd, & A., P. (1995). Understanding information technology usage: A test of competing models. *Information systems research*, 144-176. doi:10.1287/isre.6.2.144
53. Thakor, & V., A. (2020). Fintech and banking: What do we know? *Journal of financial intermediation*, 100833. doi:10.1016/j.jfi.2019.100833
54. Venkatesh, & V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information systems research*, 342-365. doi:10.1287/isre.11.4.342.11872
55. Venkatesh, V., Davis, & D., F. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management science* , 186-204.
56. Venkatesh, V., Morris, G., M., Davis, B., G., . . . D., F. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478. doi:10.2307/30036540
57. Wang, S., Y., Wang, M., Y., Lin, H., H., . . . I., T. (2003). Determinants of user acceptance of Internet banking: an empirical study. *International journal of service industry management*, 501-519. doi:10.1108/09564230310500192
58. Zhou, & T. (2012). Examining mobile banking user adoption from the perspectives of trust and flow experience. *Information Technology and Management*, 27-37. doi:10.1007/s10799-011-0111-8
59. Zhou, & T. (2012). Examining mobile banking user adoption from the perspectives of trust and flow experience. *Information Technology and Management*, 27-37.