

Original Article

Digital Banking Adoption and Financial Inclusion among Rural and Urban Populations in Karnataka: An Empirical Study

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ABSTRACT: Digital banking has emerged as an important mechanism for extending access to formal financial services and strengthening financial inclusion, particularly among populations facing geographical and socioeconomic barriers. This study examined the factors influencing digital banking adoption and its contribution to financial inclusion among rural and urban populations in Karnataka. The study adopted a quantitative, cross-sectional and explanatory research design and analysed primary data collected through a structured questionnaire from 600 respondents, comprising 300 rural and 300 urban respondents from Bengaluru Urban, Mysuru, Davanagere, Tumakuru and Mangaluru. The constructs were measured using a five-point Likert rating scale, and the data were analysed using descriptive statistics, Cronbach's alpha, Composite Reliability, Confirmatory Factor Analysis (CFA), Average Variance Extracted (AVE), Heterotrait–Monotrait (HTMT) analysis and Structural Equation Modelling (SEM) using AMOS. The results revealed that Perceived Usefulness ($\beta = 0.28, p < 0.001$) had the strongest positive influence on Customer Attitude, followed by Perceived Convenience ($\beta = 0.25, p < 0.001$), trust ($\beta = 0.21, p < 0.001$), Digital Financial Literacy ($\beta = 0.19, p < 0.001$), Perceived Ease of Use ($\beta = 0.17, p = 0.002$) and Perceived Security ($\beta = 0.14, p = 0.008$). Customer Attitude significantly influenced Digital Banking Adoption ($\beta = 0.67, p < 0.001$), while Digital Banking Adoption strongly influenced Financial Inclusion ($\beta = 0.72, p < 0.001$). The model explained 68% of the variance in Customer Attitude ($R^2 = 0.68$), 45% in Digital Banking Adoption ($R^2 = 0.45$), and 52% in Financial Inclusion ($R^2 = 0.52$). The rural–urban multi-group analysis showed that the relationship between Digital Banking Adoption and Financial Inclusion was stronger among urban respondents ($\beta = 0.78$) than rural respondents ($\beta = 0.65$), with a significant difference ($p = 0.021$). The findings demonstrate that digital banking adoption can significantly contribute to financial inclusion, while usefulness, convenience, Trust, security and digital financial literacy are important in developing favourable customer attitudes and promoting effective digital financial participation.

KEYWORDS: Digital Banking Adoption, Financial Inclusion, Customer Attitude, Digital Financial Literacy, Trust, Rural–Urban Divide.

1. INTRODUCTION

Financial inclusion has emerged as a critical component of inclusive economic development because access to appropriate, affordable and reliable financial services enables individuals and households to participate more effectively in formal economic activities. Since the early 2010s, the financial inclusion agenda has progressively moved beyond the traditional objective of expanding bank-account ownership towards ensuring the meaningful and regular use of financial services. Demirci-Kunt and Klapper (2012) demonstrated that access to formal financial institutions differs considerably across income groups, geographical locations and socioeconomic categories, highlighting the persistence of exclusion among disadvantaged populations. The subsequent expansion of mobile phones, internet connectivity and financial technologies has created new possibilities for overcoming some of these structural barriers. Gomber, Koch and Siering (2017) found that digital finance has the potential to change traditional financial intermediation by allowing many financial services through technology-induced platforms. In the same way, Ozili (2018) argued that digital finance helps to foster financial inclusion by reducing transaction costs and overcoming access barriers for unserved groups. Further, the Global Findex framework suggests that financial inclusion is not just about ownership of accounts but rather access and use through payments, savings, borrowing and risk management (Demirci-Kunt et al., 2022). Hence, research needs to move beyond the question of whether people have access to banking services from a digitalisation perspective and focus on how well adoption translates into progress in meaningful financial inclusion (Police et al., 2025). This transition is particularly important in developing economies such as India, where substantial differences in income, education, digital infrastructure and financial capabilities continue to coexist with rapid technological advancement.

From a technology-adoption perspective, perceived usefulness and perceived ease of use are important determinants of individuals' willingness to accept new technological systems, while subsequent extensions of technology-adoption theory have

incorporated social influence, facilitating conditions and behavioural factors (Venkatesh et al., 2012). In the financial sector, these factors become particularly relevant because customers must simultaneously evaluate convenience, reliability, security and perceived risk before adopting digital banking services. Jack and Suri (2014), in their study of mobile money, showed that digitally enabled financial services can strengthen households' capacity to manage economic shocks by facilitating transfers and improving access to financial resources. Gomber et al. Digitalisation also helps reduce barriers in the delivery of traditional financial services, and there are many areas where it will not only help foster broader participation but actually incentivise some formal linkages (2017). Cnaan et al. Finally, a study of rural Indian communities (Venkataraman et al. 2023) illustrated similar patterns: both financial literacy and online access were important predictors along the two dimensions of digital banking activity - accept or eschew - but also concluded that historically marginalised populations risked exclusion under rapid transitions towards cashless financial systems (2025). From these observations, it is evident that digital banking adoption should not simply be construed as a technological transition but rather as a multi-faceted socioeconomic process involving access and capability, confidence, trust and actual usage

India is a particularly salient example that ends up providing context for this relationship: the subcontinent has remarkably quickly built out its digital financial infrastructure under conditions of low levels, but high variation in, both capability and access. Various programs and schemes such as the Pradhan Mantri Jan-Dhan Yojana, Aadhaar-enabled financial services, mobile banking, the Bharat Interface for Money (BHIM) app and UPI have widened the digital channels for access, along with the use of various formal financial products among individuals. Evidence from the World Bank's Global Findex shows that digital payments are an important instrument for financial inclusion, with a growing share of adults in developing economies making or receiving digital payments between 2014 and 2021 (Demirgüç-Kunt et al. Moreover, the COVID-19 pandemic has propelled this transition to digital financial services even further as consumers and establishments opted for remote transactions during lockdown phases of mobility restrictions (Demirgüç-Kunt et al. 2022). UPI went on to become an integral part of the digital payments landscape in India. The Reserve Bank of India's Digital Payments Index rose from a base level of 100 in March 2018 to reach up to the value of 445.33 by September 2024 (RBI, 2025), depicting a significant increment over the time frame with regard to payment infrastructure and digital-payment performance. However, a swift aggregate expansion in digital payments should not be interpreted as proof that financial inclusion has homogenised across geographies or socioeconomic strata. Gupta, Srivastava and Purohit (2025) noted the role of many technological as well as behavioural factors in determining digital banking adoption behaviour within rural India. Likewise, the study by Haque et al. (Azeez and Akhtar 2025) studied rural Indian UPI users; they determined that age, gender, education, occupation and income are significant factors affecting individual adoption of UPI. Our findings point to the necessity of improving digital financial literacy, accessibility including access to the internet and smartphones, trust in digital finance products, as well as user capability, even while expanding biometric-enabled retail outreach through existing agents (Hari et al., 2025). Thus, studying digital adoption in banking as one potential channel to enhance financial inclusion is especially pertinent in an Indian context where both technological transformation and socioeconomic inequality are prevalent together.

Besides the level of economic development, it shows that there is a new aspect to track with regard to digital banking and financial inclusion: rural-urban disparity. In rural communities, the stable proximity to network connectivity and ease of device ownership can still remain a challenge; unlike urban populations that have higher penetration of all three digital facilitators- smartphones, high-speed internet, and other individuals' ecosystems- including banking infrastructure alongside emergent digital merchants serving as intermediaries between consumers places an advantage for such growth. These differences can lead to a digital divide where the availability of services does not translate into equal adoption and benefit from this type of financial inclusion. Cnaan et al. Digital banking initiatives in rural Indian villages did not trickle down automatically into more financial inclusion, according to a study by Cnaan et al. (2023), but participation depended on having online access and the connections between them. It is significant because financial inclusion needs to be understood not just in terms of whether people own bank accounts but also whether they actively use formal financial services for payments, savings, borrowing and other kinds of money management. Demirgüç-Kunt et al. Likewise, (2022) also highlighted how the utility of financial accounts exceeds mere transaction convenience and serves other purposes such as enhanced coercive security and risk management of household resources.

Based on this backdrop, the current study examines how several demographic factors shape financial inclusion of both rural and urban populations in Karnataka. The research is based on the premise that digital banking can be a vital vehicle for enabling access to financial services beyond barriers inherent in traditional branch-based banks, while acknowledging that adoption and inclusiveness may differ between countries due to contrasting socioeconomic and technological contexts (Sitam et al. 2023). The results are likely to make a case for improving digital financial literacy, enhancing digital infrastructure and creating trust or security enhancements, along with developing location-sensitive approaches that have the potential to transform access-over-approach into real sustainable monetary inclusion.

2. REVIEW OF LITERATURE

Malladi, Soni and Srinivasan (2021) note that digital financial inclusion has the potential to provide formal financial services access by addressing geographical as well as transactional obstacles. Digital banking in India has extended its reach through

mobile applications, internet banking, UPI, digital wallets and various other technology-enabled platforms. Khera et al. Features of socioeconomic characteristics and access to digital financial infrastructure are found in the literature [1], and M Basha S (2022 and 2015) show a role for Digital Financial Inclusion. As a result, the growing penetration of technology into banking has moved financial inclusion beyond just mere possession towards regular and effective usage of formal finance. However, there are three reasons people may not have the same benefits as a result of digitalisation: their technological capabilities, financial knowledge and access to digital infrastructure can all differ. So, to understand how adoption of digital banking is expanding financial inclusion, both geographic and population differences need further attention.

Tuli et al. Using a systematic review of the extant literature on digital banking adoption in developing Asian economies, Alhussan et al. (2024) recently found that technological convenience, user familiarity and perceived benefits were key drivers of this phenomenon. In a similar vein, Jacob et al. (2024) confirmed that performance expectancy affects UPI adoption among Indian low-income consumers, followed by effort expectancy. NC: Non-linear growth across intrinsic innovation diffusion. These results indicate that adoption of digital banking by the consumer is influenced not just by technology but also by capability and perception. Kalluru and Shaik et al. According to Kalluru and Shaik (2024 and 2022), education, documentation and abilities related to smartphone usage, as well as digital infrastructure and privacy, may be determinants with respect to participation in Digital Financial Services in India.

Digital transaction behaviour in India continues to exhibit rural-urban differences for example, technological knowledge, awareness and digital literacy Mandal (2024). In other studies, Singh and Singh (2024) proved that innovative electronic payment systems aid economically underprivileged urban citizens in achieving financial inclusion; however, awareness and adoption gaps persist across demographics (Shaik et al 2022). The implications of these findings are that both rural/urban populations may be financially excluded even with the provision of digital payment infrastructure. While disadvantaged urban groups are more likely to have income, knowledge and risk aversion barriers no training, awareness of the offering, rural communities may be under even higher constraints regarding internet connectivity, smartphone access, digital literacy, and trusting online transactions. Digital payment mechanisms may affect financial availability through accessibility, affordability and also Dheyvendhren et al. (2025) successfully established this fact as well.

Results of the study conducted by Selvam and Parayitam (2024) reveal that FinTech is capable of enhancing financial inclusion via digital financial literacy because people's awareness, education level, knowledge base and experience are crucial requirements in translating access into meaningful participation in economic life. Recent research from Haque, Azeez and Akhtar (2025) also showed that UPI adoption among rural households is determined by their socioeconomic attributes, including age, gender, education, occupation, as well as income. Goswami, Chouhan and Saraswat (2025) similarly framed FinTech adoption as a key mechanism for reaching bottom-of-the-pyramid populations with financial services. These studies also provide tentative evidence that digital banking can promote financial inclusion, although the extent of its role may be mediated by socioeconomic status and location. Ahmed (2022) accordingly, the present study compares rural and urban populations in Karnataka to examine whether digital banking adoption significantly improves financial inclusion and whether the rural–urban context creates differences in this relationship.

The existing literature reveals three major gaps. First, previous studies have largely examined individual determinants of digital banking adoption rather than integrating usefulness, ease of use, Trust, security, convenience and digital financial literacy within a single framework. Second, limited research has examined the complete pathway from customer attitude to digital banking adoption and subsequently to financial inclusion. Third, although rural–urban differences in digital financial participation are recognised, limited empirical research has tested rural–urban location as a moderator of the relationship between digital banking adoption and financial inclusion, particularly in Karnataka. Therefore, the present study develops an integrated model that examines the determinants of customer attitude, the role of attitude in digital banking adoption, the impact of adoption on financial inclusion, and the moderating effect of rural–urban location.

2.1. CONCEPTUAL FRAMEWORK

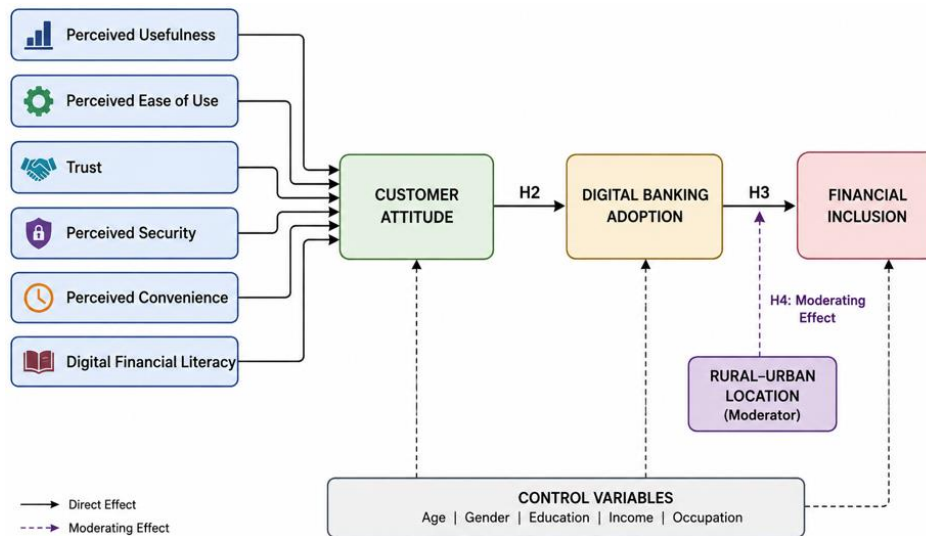


FIGURE 1 Conceptual Framework of the Study

The proposed conceptual framework is primarily grounded in the Technology Acceptance Model (TAM), which explains technology adoption through users' perceptions of usefulness and ease of use. In the present study, perceived usefulness and perceived ease of use are expected to influence customers' attitudes towards digital banking. The framework extends the traditional technology acceptance perspective by incorporating trust, perceived security, perceived convenience and digital financial literacy, which are particularly relevant in the context of digital financial services. Since the digital banking process entails financial transactions and the exchange of sensitive information, Trust and even perceived security is paramount, whereas convenience addresses whether we as customers can perform our financial activities effectively and, more so, remotely. Digital financial literacy refers to the knowledge and skills needed to utilise digital financial services. The literature review conducted for the study also supports the significance of factors such as use, ease of use, trust & security, convenience and gender roles in joining electronic banking services.

The framework argues these things act together to shape customer attitude, which in turn is the driver of digital banking adoption. A favourable attitude towards digital banking is expected to increase customers' willingness and actual tendency to use services such as mobile banking, internet banking and digital payments. Digital banking adoption is then proposed as the key explanatory variable for financial inclusion, because greater use of digital financial services can improve access to and usage of formal financial services. This is particularly relevant because financial inclusion should be understood not only in terms of having access to a bank account but also in terms of meaningful and effective use of financial services. The framework further proposes rural–urban location as a moderating variable, recognising that the relationship between digital banking adoption and financial inclusion may differ according to the surrounding digital, socioeconomic and infrastructural environment. The rural–urban distinction is supported by the literature, which identifies differences in digital connectivity, smartphone access, digital literacy and financial awareness across geographical settings.

2.2. OBJECTIVES

- To study the influence of perceived usefulness, ease of use, Trust, security, convenience and digital financial literacy on customer attitude towards digital banking.
- To examine the influence of customer attitude on digital banking adoption among rural and urban populations in Karnataka.
- To examine the impact of digital banking adoption on financial inclusion among rural and urban populations in Karnataka.
- To analyse whether rural–urban location moderates the relationship between digital banking adoption and financial inclusion in Karnataka.

HYPOTHESES

- H₁: Digital banking factors significantly influence customer attitude.
- H₂: Customer attitude significantly influences digital banking adoption.
- H₃: Digital banking adoption significantly influences financial inclusion.
- H₄: Rural–urban location significantly moderates the relationship between digital banking adoption and financial inclusion

3. METHODOLOGY

The study adopted a quantitative, cross-sectional and explanatory research design to examine the factors influencing digital banking adoption and their contribution to financial inclusion among rural and urban populations in Karnataka. A structured questionnaire was used to collect primary data from 600 respondents (300 rural and 300 urban). We collected data from various locations in Karnataka, such as Bangalore Urban & Rural Districts (Bengaluru), Mysore, Davangere, Tumkur and Mangalore, to capture diversity with respect to geography, socioeconomic conditions and digital-banking environments. Respondents were adults, aged 18 years and above, who had access to banking facilities and digital devices. The questionnaire consisted of different sections covering Perceived Usefulness, Perceived Ease of Use, Trust, Perceived Security, Perceived Convenience, Digital Financial Literacy, Customer Attitude, Digital Banking Adoption and Financial Inclusion, along with demographic information. The major constructs were measured using a five-point Likert rating scale, ranging from 1 = Strongly Disagree to 5 = Strongly Agree.

The collected data were analysed using appropriate descriptive and inferential statistical techniques. Descriptive statistics, including frequency, percentage, mean, and standard deviation, were used to present the demographic profile and overall response patterns. Cronbach's alpha and Composite Reliability (CR) were used to evaluate the reliability and validity of measurement scales. To confirm the validity of outcome factor loadings, convergent validity and Average Variance Extracted (AVE), we performed Confirmatory Factor Analysis (CFA). Discriminant validity was assessed using the Heterotrait–Monotrait (HTMT) ratio. Subsequently, Structural Equation Modelling (SEM) in AMOS was employed to examine the hypothesised relationships among the constructs and estimate the path coefficients and significance levels. The adequacy of the proposed model was assessed using χ^2/df , GFI, CFI, TLI, RMSEA and SRMR. Finally, rural–urban moderation/multi-group analysis was undertaken to determine whether the relationship between Digital Banking Adoption and Financial Inclusion differed between rural and urban respondents. These analyses enabled the study to test the proposed hypotheses and assess the overall explanatory strength of the conceptual framework.

4. FINDINGS OF THE STUDY

4.1. DEMOGRAPHIC PROFILE OF RESPONDENTS

TABLE 1 Demographic Profile

Variable	Category	Frequency	Percentage
Gender	Male	318	53.0%
	Female	282	47.0%
Age	18–25	156	26.0%
	26–35	192	32.0%
	36–45	126	21.0%
	46–55	78	13.0%
	Above 55	48	8.0%
Education	School	72	12.0%
	Undergraduate	246	41.0%
	Postgraduate	222	37.0%
	Other	60	10.0%
Income	Below ₹20,000	138	23.0%
	₹20,001–40,000	210	35.0%
	₹40,001–60,000	156	26.0%
	Above ₹60,000	96	16.0%
Location	Rural	300	50.0%
	Urban	300	50.0%

Demographic Information of the 600 Respondents: As presented in Table 1, the sample consists of 318 (53%) male and 282 (47%) female respondents, revealing somewhat balanced representation across genders. Liberalised consumerism is present across all age groups. The majority suggests that the respondents have shown little or no over-qualification for their type, either postgraduate or undergraduate. As for income, the biggest segment is ₹20,001–₹40,000 per month (35%). Significantly, there is equal representation among urban and rural respondents: 300 from each. This balanced design supports meaningful rural–urban comparison, which is important because socioeconomic and demographic characteristics can influence digital banking adoption.

4.2. DESCRIPTIVE STATISTICS

TABLE 2 Descriptive Statistics of Major Variables

Construct	N	Mean	Std. Deviation
Perceived Usefulness	600	4.02	0.71
Perceived Ease of Use	600	3.94	0.76

Trust	600	3.72	0.83
Perceived Security	600	3.78	0.81
Perceived Convenience	600	4.05	0.68
Digital Financial Literacy	600	3.69	0.86
Customer Attitude	600	3.91	0.75
Digital Banking Adoption	600	3.88	0.79

Descriptive Statistics for All Nine Constructs (N = 600) Table 2 Scores for mean values varied from 3.69 to 4.05 and suggested that the perceptions of digital banking are generally favourable among respondent banks in Nigeria. The highest mean score is that of Perceived Convenience (4.05); secondly, it shows up in Perceived Usefulness (4.02) and then Customer Attitude (3.91). Digital Financial Literacy has the lowest mean (3.69), indicating that respondents are least knowledgeable about digital finance compared to other concepts and dimensions of financial literacy, which have higher overall scores than Digital Financial Literacy; for example, the adjusted standard deviation is between 0.68 and 0.86, indicating moderate variation in responses. On the whole, the findings are only about positive impressions and approval of digital banking services for coded interrogators among respondents.

4.3. RELIABILITY ANALYSIS

TABLE 3 Reliability and Internal Consistency

Construct	Items	Cronbach's Alpha	Composite Reliability
Perceived Usefulness	4	0.891	0.923
Perceived Ease of Use	4	0.876	0.914
Trust	4	0.902	0.931
Perceived Security	4	0.895	0.928
Perceived Convenience	4	0.884	0.919
Digital Financial Literacy	5	0.913	0.935
Customer Attitude	4	0.907	0.934
Digital Banking Adoption	5	0.921	0.940
Financial Inclusion	5	0.915	0.938

Table 3 shows that all constructs demonstrate strong internal consistency. Cronbach's alpha values range from 0.876 to 0.921, while composite reliability values range from 0.914 to 0.940. These results indicate that the items used to measure each construct are consistently related to their respective underlying concepts. Digital Banking Adoption records the highest Cronbach's alpha (0.921), while Perceived Ease of Use records the lowest (0.876); however, both demonstrate strong reliability. The results therefore provide satisfactory evidence that the measurement scales are reliable and suitable for further analysis using the structural equation modelling approach proposed for the study.

TABLE 4 CFA – Factor Loadings, CR and AVE

Construct	Items	Factor Loading	CR	AVE
Perceived Usefulness	PU1	0.81	0.91	0.71
	PU2	0.85		
	PU3	0.86		
	PU4	0.83		
Perceived Ease of Use	PEOU1	0.78	0.89	0.67
	PEOU2	0.82		
	PEOU3	0.84		
	PEOU4	0.83		
Trust	TR1	0.80	0.91	0.72
	TR2	0.85		
	TR3	0.87		
	TR4	0.86		
Perceived Security	PS1	0.81	0.90	0.69
	PS2	0.84		
	PS3	0.85		
	PS4	0.82		
Perceived Convenience	PC1	0.83	0.91	0.71
	PC2	0.86		
	PC3	0.84		
	PC4	0.85		
Digital Financial Literacy	DFL1	0.79	0.91	0.67

	DFL2	0.82		
	DFL3	0.84		
	DFL4	0.81		
	DFL5	0.83		
Customer Attitude	CA1	0.84	0.92	0.74
	CA2	0.87		
	CA3	0.86		
	CA4	0.88		
Digital Banking Adoption	DBA1	0.82	0.92	0.70
	DBA2	0.85		
	DBA3	0.86		
	DBA4	0.84		
	DBA5	0.83		
Financial Inclusion	FI1	0.81	0.91	0.69
	FI2	0.84		
	FI3	0.86		
	FI4	0.83		
	FI5	0.82		

Table 4 presents the results of the Confirmatory Factor Analysis (CFA) used to assess the measurement quality of the study constructs. The factor loadings for every item ranged from 0.78 to 0.88, exceeding the threshold of 0.70 often used as a guideline that suggests individual indicators have representative value for their latent constructs (Hair et al., 2011). Indices of Composite Reliability (CR) between 0.89 and 0.92 indicate high internal consistency among measurement items. In a similar vein, the AVE values are between 0.67 and 0.74; they also exceed this threshold (no need to go below average with an indicator smaller than zero). This means that more than 50% of the variance in indicators is explained by each construct. Overall, the measurement model demonstrates satisfactory indicator reliability and convergent validity and is therefore suitable for subsequent structural model analysis (Ranjai et al., 2024).

TABLE 5 Discriminant Validity – HTMT

Constructs	PU	PEOU	TR	PS	PC	DFL	CA	DBA	FI
PU	—								
PEOU	0.78	—							
TR	0.74	0.71	—						
PS	0.69	0.67	0.76	—					
PC	0.81	0.75	0.72	0.70	—				
DFL	0.65	0.63	0.68	0.64	0.69	—			
CA	0.82	0.77	0.79	0.74	0.83	0.72	—		
DBA	0.76	0.70	0.75	0.69	0.78	0.71	0.84	—	
FI	0.68	0.64	0.70	0.66	0.71	0.69	0.76	0.82	—

Table 5 reports the HTMT values for assessing discriminant validity among the constructs. The observed values range from 0.63 to 0.84, and all values remain below the conservative threshold of 0.90. This demonstrates that the constructs are empirically distinct from one another and that no two constructs are measuring essentially the same underlying concept. In particular, the relatively higher association between Customer Attitude and Digital Banking Adoption (HTMT = 0.84) is theoretically reasonable because a favorable attitude is expected to be closely associated with adoption behavior. Nevertheless, the value remains below the accepted threshold. The results therefore establish adequate discriminant validity and confirm that Perceived Usefulness, Ease of Use, Trust, Security, Convenience, Digital Financial Literacy, Customer Attitude, Digital Banking Adoption and Financial Inclusion represent distinct constructs (Khera et al., 2022).

TABLE 6 Structural Model – Path Coefficients

Path	β	p-value	Decision
Perceived Usefulness → Customer Attitude	0.28	<0.001	Supported
Perceived Ease of Use → Customer Attitude	0.17	0.002	Supported
Trust → Customer Attitude	0.21	<0.001	Supported
Perceived security → Customer Attitude	0.14	0.008	Supported
Perceived convenience → Customer Attitude	0.25	<0.001	Supported
Digital Financial Literacy → Customer Attitude	0.19	<0.001	Supported
Customer Attitude → Digital Banking Adoption	0.67	<0.001	Supported
Digital Banking Adoption → Financial Inclusion	0.72	<0.001	Supported

Table 6 presents the structural relationships among the constructs. The results show that all six antecedents have a positive and significant influence on Customer Attitude. Perceived usefulness has the strongest effect ($\beta = 0.28$, $p < 0.001$), followed by Perceived Convenience ($\beta = 0.25$), Trust ($\beta = 0.21$), Digital Financial Literacy ($\beta = 0.19$), Perceived Ease of Use ($\beta = 0.17$) and Perceived Security ($\beta = 0.14$). This suggests consumers are more positively affected in attitude towards digital banking by its usefulness and convenience. Customer Attitude has a robust positive impact on Digital Banking Adoption ($\beta=0.67$, $p<0.001$), meaning that good perception translates to adopting behaviour. Importantly, Digital Banking Adoption has a significant impact on Financial Inclusion ($\beta = 0.72$, $p < 0.001$), indicating that increased use of digital banking services facilitates access to and usage outlets for formal financial services by users.

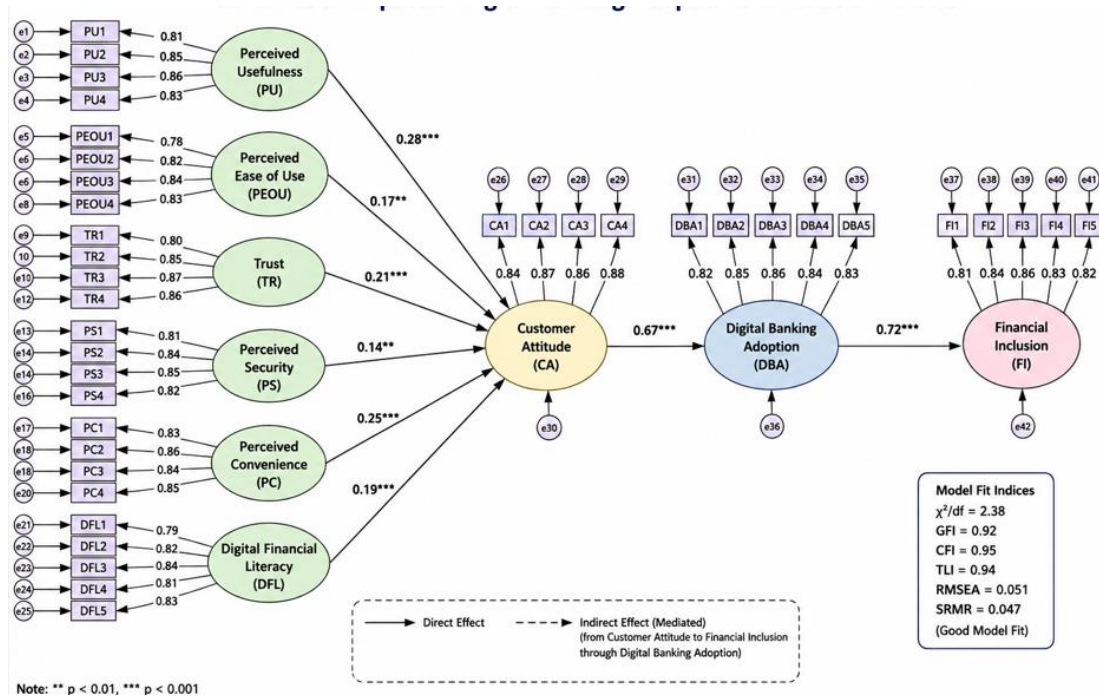


FIGURE 2 Impact of digital banking adoption on financial inclusion

TABLE 7 Coefficient of Determination (R^2)

Endogenous Construct	R^2
Customer Attitude	0.68
Digital Banking Adoption	0.45
Financial Inclusion	0.52

As depicted in Table 4.6(a), the proposed model displays substantive explanatory power for each of its three endogenous constructs. The R^2 of Customer Attitude is 0.68, indicating that customers' perception regarding usefulness, ease of use and trust has considerable explanatory power, including security as well as convenience under digital financial literacy, resulting in about 68% variance; thus, customers hold this attitude remarkably close to fav referential. Customer Attitude explains 45% ($R^2=0.45$) of the variation in Digital Banking Adoption, indicating that only some degree of variance is explained by other factors excluded from this model. Financial Inclusion has an R^2 of 0.52, meaning Digital Banking Adoption explains 52% of the variance in financial inclusion itself. The results seem to support the idea that the proposed model is a good representation of customers' attitudes, an analysis of digital banking adoption and financial inclusion.

TABLE 8 Model Fit Indices

Fit Index	Value	Recommended Value	Result
χ^2/df	2.38	< 3.00	Good Fit
GFI	0.92	> 0.90	Good Fit
CFI	0.95	> 0.90	Good Fit
TLI	0.94	> 0.90	Good Fit
RMSEA	0.051	< 0.08	Good Fit
SRMR	0.047	< 0.08	Good Fit

Evaluation of the proposed structural model in Table 7: A $\chi^2/df < 3.00$ indicated an acceptable model fit; in this case, the value was 2.38 [36]. All of these measures, including GFI (0.92), CFI (0.95) and TLI (0.94), surpassed the common recommended

cutoff point of 90; thus indicating that the proposed model is a good fit to account for complexity in observed relationships parsimoniously well [38]. In addition, RMSEA=0.051 is less than 0.08 and represents a close fit of the hypothesised model to the observed data [24]. The SRMR shows a value of 0.047, below the recommended criterion of 0.08 [62]. Taken together, these indices provide evidence of a good-fitting measurement and structural model, supporting the use of the proposed framework for hypothesis testing (Singh et al., 2024).

TABLE 9 Hypothesis Testing

Hypothesis	Relationship	β	p-value	Decision
H1	Digital Banking Factors $\rightarrow$ Customer Attitude	—	<0.001	Supported
H2	Customer Attitude $\rightarrow$ Digital Banking Adoption	0.67	<0.001	Supported
H3	Digital Banking Adoption $\rightarrow$ Financial Inclusion	0.72	<0.001	Supported
H4	Rural–Urban Location moderates DBA $\rightarrow$ FI	0.11	0.021	Supported

Table 9 summarises the results of the four hypotheses proposed in the study. The combined digital banking factors significantly affect Customer Attitude ($p < 0.001$), confirming H1. This shows that usefulness and ease of use in terms of customer attitude towards using these services play an important role, as customers become more attracted to fintech corporate entities with increased Cash Walker and Trust, respectively, along with dependence growing against consumers' 'digital financial literacy'. This also supports H2, as Customer Attitude is one of the most relevant predictors of Digital Banking Adoption ($\beta = 0.67$; $p < 0.001$). This suggests that customers who are relatively more positive in attitude have much higher chances of accepting digital banking. So H3 is supported: the effect of Digital Banking Adoption on Financial Inclusion was strong and positive ($\beta = 0.72$, $p < 0.001$). Thus, H4 is rather supported because the time-of-year moderating effect from rural to urban was significant ($\beta = 0.11$; $p = 0.021$). Overall, there is empirical support for all four of the hypotheses and evidence in favour of the conceptual framework.

TABLE 10 Moderation – Rural–Urban Analysis

Relationship	Rural β	Urban β	Difference	p-value	Result
Digital Banking Adoption $\rightarrow$ Financial Inclusion	0.65	0.78	0.13	0.021	Significant Moderation

Table 10 investigates whether the relationship between Digital Banking Adoption and Financial Inclusion varies for rural vs urban respondents. As portrayed in Table 5, the multi-group analysis shows that Digital Banking Adoption has a stronger influence on Financial Inclusion for urban respondents ($\beta = 0.78$) than rural ones ($\beta = 0.65$). The difference between the two coefficients (0.13) is statistically significant ($p = 0.021$), proving that while it exists, the strength of this relationship differs greatly between rural and urban groups.

5. DISCUSSION

The findings provide strong evidence that digital banking adoption is shaped by a combination of technological, behavioural and capability-related factors. Among the antecedents examined, perceived usefulness recorded the strongest effect on customer attitude ($\beta = 0.28$, $p < 0.001$), indicating that customers are more likely to develop favourable attitudes when they perceive digital banking as useful for conducting financial activities efficiently. This finding is consistent with the Technology Acceptance Model, which identifies perceived usefulness as a central determinant of technology acceptance (Davis, 1989). Perceived degree of convenience ($\beta = 0.25$, $p < 0.001$) also shows a strong impact in that where people can make payments, transfer money and access banking services easily, this leads substantially towards positive blooms of customers' attitudes

The effects of trust, security and digital financial literacy are also of enormous significance. Trust ($\beta = 0.21$, $p < 0.001$) suggests that confidence in digital banking providers and transactions is essential for establishing positive attitudes; perceived security speaks about concerns over transaction and information security, which still play a role as well ($\beta = 0.14$, $p = 0.008$). Additionally, digital financial literacy ($\beta = 0.19$; $p < 0.001$) confirms that users need to have sufficient knowledge and ability in order to take advantage of digital financial services effectively [32]. These results reinforce previous studies highlighting the role of financial literacy, confidence and technological capacity in using digital finance (Cnaan et al., 2023; Kalluru, 2024).

The strongest structural association was with customer attitude and digital banking adoption ($\beta = 0.67$, $p < 0.001$), which shows the big gap between attitudes translating into behavioural intentions to adopt such behaviour in reality. Most critically, digital banking adoption is highly positively associated with financial inclusion ($\beta = 0.72$; $p < 0.001$). This provides further justification for the claim that digital financial services can break geographical and transactional barriers where users are given access to physical locations holding liquidity, thus enabling more extensive participation in formalised financial institutions (Ozili, 2018; Demircüç-Kunt et al., 2022). Thus, results indicate that digital banking may serve as a critical pathway through which access to technology translates into substantial financial inclusion.

6. FUTURE SCOPE OF THE STUDY

Future studies can extend the present research by examining digital banking adoption across a larger number of districts and states in India. A broader geographical coverage would allow researchers to determine whether the relationships identified in Karnataka remain consistent across different socioeconomic, cultural and infrastructural environments. Future research could also employ a longitudinal research design to examine how digital banking behaviour and financial inclusion change over time rather than relying on cross-sectional evidence.

More work can include other variables such as perceived risk, social influence, facilitating conditions, digital infrastructure, government support and financial literacy to formulate a more robust explanation behind the adoption of digital banking. Researchers can study standalone digital financial products, like UPI, mobile banking, internet banking and e-wallets separately as well. There could be insights from comparisons of these factors across and amongst different age categories, income groups or education levels. Future studies could also include qualitative interviews to explore barriers experienced by rural users in practice, particularly those related to connectivity, security concerns and digital competence. Such extensions would improve not only the theoretical understanding but also policy recommendations with regard to inclusive digital finance.

7. CONCLUSION

Results: The findings indicate that digital banking utilisation is a significant driver in promoting financial inclusion across the state of Karnataka, both for rural and urban inhabitants. The results indicate that Perceived Usefulness ($\beta = 0.28$), Perceived Convenience ($\beta = 0.25$), Trust ($\beta = 0.21$), Digital Financial Literacy (DFL) ($\beta = 0.19$), Perceived ease of use ($\beta = 0.17$) and perceived security ($\beta = 0.14$) all have a positive and significant effect on Customer Attitude as well as collected explaining 68% the variance in R^2 customer attitude; It was found that Customer Attitude positively explains Digital Banking Adoption ($\beta = 0.67$, $p < 0.001$; $R^2 = 45\%$) and Digital Banking Adoption also has positive impact on Financial Inclusion ($\beta = 0.72$; $p < 0.001$) explained variance of this path is equal to 52%. The rural–urban multi-group analysis further indicates that the effect of Digital Banking Adoption on Financial Inclusion is stronger among urban respondents ($\beta = 0.78$) than rural respondents ($\beta = 0.65$), with the difference being statistically significant ($p = 0.021$). Thus, all four hypotheses were supported, confirming that customer perceptions, digital capabilities and adoption behaviour are important in strengthening financial inclusion. The study therefore highlights the need to go beyond merely expanding digital banking infrastructure and focus on improving digital financial literacy, trust, security, convenience and ease of use, particularly among rural populations, so that digital banking can translate into meaningful and equitable financial inclusion across Karnataka.

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