



Adoption and Impact of Digital Banking and FinTech Services in Karnataka: An Empirical Analysis

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Abstract – Digital Banking and Financial Technology (FinTech) have grown rapidly in India and are gradually changing the financial sector landscape and behavior of the financial sector in India, more so in technologically advanced states like Karnataka. Against the backdrop of continuing financial sector reforms and policy thrust for increased digital financial inclusion, this study attempts to analyse the adoption and usage patterns of digital banking and FinTech services in Karnataka. The specific objectives of this study are to assess the growth in digital financial services like Unified Payments Interface (UPI), Mobile Banking, Digital Wallets, etc.; to identify the socio- economic and behavioral and other determinants of the adoption of these services, and; to examine their impact on financial inclusion and efficiency in transactions. The research design we utilized here is quantitative in nature, based on secondary and primary data sources. To capture trends in digital financial development, secondary data is collected from credible sources like Reserve Bank of India (RBI), National Payments Corporation of India (NPCI), and World Bank databases. A focused structured questionnaire is used to collect primary data and the sample was restricted to 150 respondents, chosen randomly from urban, semi-urban and rural parts of the Karnataka state using stratified random sampling technique. Statistical tools such as descriptive statistics, correlation analysis along with multiple regression models were used for analyzing the data in order to test the hypotheses developed. Empirical evidence demonstrates that digital literacy, income level and trust in digital platforms are three of the strongest positive drivers of FinTech adoption, while cybersecurity and data privacy risk factors are the biggest deterrents. It has also found that digital banking services, especially UPI-based transactions, increased access to finance, lowered transaction costs, enhanced efficiency and positively affect financial inclusion. However, very little of it is equally distributed, rural areas are hampered both due to lack of digital awareness and infrastructure. The paper closes by suggesting specific policy measures that must be adopted to bridge the digital divide, build robust cybersecurity infrastructure, and ensure growth of a sustainable FinTech ecosystem in an inclusive manner in Karnataka.

Keywords – Digital Banking; FinTech; Financial Inclusion; Digital Literacy; Karnataka.

I. INTRODUCTION

The advent of digital banking in the country can be traced back to various landmark initiatives like Pradhan Mantri Jan Dhan Yojana (PMJDY), Aadhaar-enabled payment systems and the Digital India programme that together helped in creating an electronically connected financial architecture [Government of India, 2015; RBI, 2023]. In parallel, the arrival and rapid mass penetration of innovations in Financial Technology like Unified Payments Interface (UPI), Paytm, Phonepe and different types of neo-banks have transformed banking from the sheer accessibility, cost-effectiveness, and efficiency fronts for all economic groups [Arner, Barberis, & Buckley, 2016; Narayan & Sahminan, 2018]. UPI in specific has set a world standard to real-time digital payments by being interoperable with a favourable user experience [NPCI, 2024]. Amidst developments at the national level, Karnataka, mainly the city of Bengaluru, has turned into a significant hub for Fintech [NASSCOM, 2022] driven by technology infrastructure, nexus of enterprises, skilled human capital, and a supportive innovation ecosystem that solidified the position of the state as the start of the transformation of digital finance in India. As financial sector reforms gathering pace [RBI, 2022] including banking consolidation, regulatory tightening of NBFC, and the push for digital, outside this background progress in the

financial system led by institutions like among others Reserve Bank of India (RBI) [RBI, 2021] with its facilitation measures and digital payment guidelines paralleled efforts of National Payments Corporation of India (NPCI) in creation of digital payment infrastructure like UPI, IMPS, RuPay along with government initiatives aimed at digital literacy, cyber-security, and inclusive fintech have worked together for a paradigm shift in delivery and consumption of financial services in the nation, although some issues like digital divide, cybersecurity threat, and uneven regional adoption are inescapable [Demirguç-Kunt et al., 2022] and require state-level investigation on adoption asymmetries and benefits of digital banking and fintech services, especially in innovative states like Karnataka.

Problem Statement

However, despite the rapid national growth of digital banking and FinTech services, the scale and quality of adoption are uneven and fragmented across regions, socio-economic, and geographic divides, causing concerns on inclusiveness and sustainability of this digital financial transformation, as there is a stark urban-rural divide, where urban areas experience significantly higher levels of adoption given less infrastructural barriers, higher economic indicators, and greater digital and financial literacy, whereas rural areas continue to be limited by lack



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of internet connectivity, lower levels of digital literacy, and lesser access to formal banking channels (Suri & Jack, 2016; Foster & Heeks, 2013); the issue of digital divide unequal access to more digital systems and processes exacerbates this divide as it leads to an inequality situation where low-income, elderly, uneducated populations are less able to participate in the digital financial ecosystem (van Dijk, 2020; Hilbert, 2011), and thereby undermining the fundamental goal of financial engagement, and in addition to structural inequalities, concerns on cybersecurity, data privacy and trust over digital platforms pose additional adoption barrier, as there are rising cases of digital scams, phishing attacks and unauthorized transactions all of which enkindles apprehension in users to engage with digital financial systems, particularly first-time users and businesses in vulnerable communities (Kou et al., 2021; Ryu, 2018); the challenges are further fueled by a lack of robust consumer risk awareness and grievance mechanisms, that limits users from responding effectively to security breaches, dissuading continued usage of digital services, and while attempts at policy-driven structural changes and technological solutions have been made to address these issues, gaps in adoption, infrastructure, and security continue to persist, indicating that the benefits of digital banking and FinTech are not equally distributed among all strata of society and that an empirical understanding of the determinants, behavioral patterns and structural barriers to adoption and impact, especially on a regional basis, is needed, especially in a context like that of India where advanced urban fintech ecosystems and under developed rural communities co-exist amid a rapidly evolving digital landscape (Donovan, 2012; Beck, Senbet, & Simbanegavi, 2015).

Significance of Study

The importance of the present study stems from the critical need for policy-oriented insights regarding digital banking and FinTech adoption and outcomes in a rapidly transforming digital finance environment like India with a specific focus on Karnataka, especially given its multiple ongoing reforms in the financial sector, with policy makers, regulators, and financial institutions requires a set of evidence that helps to better calibrate intervention level supports that favour financially inclusive and secure digital finance ecosystems, tapping extensive relevant literature that provides evidence of the effects of digital literacy gaps, access inequalities and structural barriers, which will inform the development of relevant policy, universal network regulations, digital awareness education initiatives and suitable infrastructural agenda while the study also aims to add to the flourishing literature on financial inclusion by providing sub-national empirical economic analysis that matches with the meta level descriptive assessments, especially amid the large underlying inequalities of technology access and education within the state and thus contribute to the academic debate by verifying and extending existing disparity notions such as financial intermediation and inclusive innovation, through evidence for viability and restoration complemented by real-world evidence (Ozili, 2018; Allen, Demircug-Kunt,

Klapper, & Peria, 2016), while also, the study yields practical implications of great importance to the fintech firms and digital banking service providers by elucidating the key determinants of usage decision-making behaviour, such as trust, usability, and perceived benefits, and so it can feature well sourced recommendations that optimize customer-centric designs, augment user interface, and improve offering strategies, especially for the underserved, while also spelling out the necessity for proactive mitigation of cyber security complaints and the establishment of confidence infrastructure to avoid switching and retain customer satisfaction in a competitive fintech market (Vives, 2019; Lee & Shin, 2018), and by embedding both primary and secondary qualitative and quantitative data approaches within an empirical generalization model, the study not only revalidates evidence-tailored decision making but also provides implementable actional specifications that align with wider socio-economic advancement targets of social inclusion, income generation, and technology growth in India while making the study beneficial for academics, policymakers, and industry experts collectively (Philippon, 2016; Thakor, 2020).

II. LITERATURE REVIEW

The existing literature on digital banking and FinTech adoption generally offers a rational perspective focusing on some established models like Technology Acceptance Model (TAM) and Diffusion of Innovation Theory, which are vital in shaping our understanding about technology acceptance and diffusion in financial services, since TAM states that perceived usefulness and perceived ease of use have significant positive influence on individuals' intention to use new technology (Davis, 1989), while on the other hand, Rogers, (2003) argues that the attributes of innovation, communication channels, and social systems impacts the speed and extent of an innovation, so these models have been employed widely in global studies about digital finance where empirical studies indicate that digital financial services have enhanced financial inclusion through increasing access to formal financial system for unbanked people (Ozili, 2020; Park & Mercado, 2018); as well as suggesting that FinTech innovations lower transaction costs, streamline financial transactions, and thus attract opportunity for financial markets and economic development by improving efficiency and ensuring transparency (Goldfarb & Tucker, 2019; Navaretti, Calzolari, Mansilla-Fernández, & Pozzolo, 2018); while at the same time, in Indian context, the body of knowledge which assesses the sudden increase in digital payments led by technological progression and policy scenario, has been increasing, so Reserve Bank of India reports bequeath that there has been an explosive growth in digital transaction, especially through platforms such as Unified Payments Interface (UPI) which has become an indispensable instrument for real-time payment and financial inclusion (RBI, 2024) as well as studies related to UPI adoption suggest that factors like convenience, interoperability and government initiatives has a significant influence on the



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extensive usage of UPI by different strata of users (Kumar, Nim, Agarwal, & Chauhan, 2019; Singh, Srivastava, & Sinha, 2020), thus substantiating the claim that digital payment system can be the most effective engine of inclusive growth since it will reduce cash dependency and widen access to financial services, but in spite of all the growing body of literature at national and global level, regional and state level studies are lacking, especially in case of Karnataka as the few existing studies has primarily concentrated on urban fintech ecosystem like Bengaluru while ignoring rural and semi-urban uptake, and by that neglecting the localized drivers and consequences of digital banking and FinTech services in heterogeneous socioeconomic distribution within the state, thus making it indispensable to consider region specific empirical inquiry that combine theoretical and empirical perspectives to analyse the adoption and use of digital financial innovations in different context, and also, considering state level will facilitate to acquire more depth on the financial inclusion and digital transformation at sub-national level (Chatterjee, Rana, Dwivedi, & Baabdullah, 2021; Shaikh, Glavee-Geo, & Karjaluo, 2017).

Research Gap

While numerous cross country level data studies have provided insights into the broad trends and outputs of digital banking and financial technology systems, without analyzing it in a localized or micro-empirical context there is a substantial literature gap in significant Indian states including Karnataka one of India's leading technology and fintech hubs—with very few rigorous studies at the state level that capture the specific patterns, determinants and socio-economic inequalities in the uptake of digital banking, and yet the majority of the studies conduct the same analysis and draw the same conclusions at the national level, often overlooking the intra-state heterogeneity in terms of infrastructure, income distribution and digital literacy (Mothobi & Grzybowski, 2017; Bongomin, Munene, Ntayi, & Malinga, 2018), and furthermore, there have been very few micro-led initiatives to analyze individual household or user behavior nonetheless, preferences and constraints surrounding the utilization of digital banking or fintech services, which needs to be understood at a granular level to truly appreciate its role in the socio-economic dynamics of financial inclusion, however in Karnataka, for instance, urban Bangalore city evinces such high fintech penetration that the rural and semi-urban sectors are exponentially disparately impacted by informational and structural barriers (Evans & Pirchio, 2015; Gosavi, 2018), and although some of the previous studies have assessed the uptake of mobile payments and banking in these space, commonly aggregate datasets or small selection surveys have neither been deep nor wide enough to ascertain such facets of the user-level decision making process as trust, perceived risk, financial awareness and even cultural predisposition (Oliveira, Thomas, Baptista, & Campos, 2016; Singh & Malik, 2019), and most importantly, the vibrant nature and scale of how quick fintech innovations evolve which range from UPI to digital wallets to mobile app led banking tend to coalesce with the

level of effectiveness that such tools cover areas of financial inclusion, money transfer footprints and ease of customer experience but so little has been documented in terms of comprehensive evidence that can aggregate and systematically analyze both primary household data and secondary institutional data to be able to produce cosmetic changes on the ground and rework the deficiencies in theory to have well thought policy changes to deliver geographical relevance. (Bateman, Duvendack, & Loubere, 2019; Zetzsche, Buckley, Arner, & Barberis, 2017).

Objectives of the Study

1. To examine the growth of digital banking in Karnataka with a particular focus on the increasing adoption of platforms such as Unified Payments Interface (UPI), mobile banking applications, internet banking, and digital wallets
2. To identify determinants of FinTech adoption among individuals in Karnataka, including variables such as income level, education, digital literacy, accessibility to internet services, perceived ease of use, trust in digital platforms, and perceived risks
3. To assess the impact on financial inclusion to enhancing financial inclusion in Karnataka by improving access to formal financial services, reducing transaction costs, increasing convenience
4. To analyze challenges and risks associated with digital banking and FinTech usage and risks faced by users in adopting and utilizing digital banking and FinTech services, including issues related to cybersecurity threats, data privacy concerns, digital fraud, lack of digital literacy, infrastructural limitations, and trust deficits

Hypotheses related to the study

1. H1: Digital literacy positively affects adoption
2. H2: Income significantly influences fintech usage
3. H3: FinTech usage improves financial inclusion
4. H4: Security concerns negatively affect adoption

III. RESEARCH METHODOLOGY

The current research adopts a mixed research design comprising of descriptive and analytical methods where the descriptive part helps to provide in-depth understanding into the status, trends and patterns of digital banking and FinTech services being used in Karnataka, while the analytical method studies the relationships among significant variables and tests hypotheses relating to adoption behaviour and financial inclusion thereby ensuring a sufficient empirical base (Sekaran & Bougie, 2016; Kothari, 2004). The study also relies on secondary and primary data, with secondary data collected from institutional sources such as the Reserve Bank of India (RBI), National Payments Corporation of India (NPCI), and the World Bank, which ensure that that the datasets of digital payment trends, indicators of financial inclusion, and macro-level developments in the financial sector serve as a contextual framework relating to the evolution of digital banking and fintech ecosystems (World Bank, 2021; RBI, 2024), while the primary data are gathered through a structured questionnaire containing both closed-ended and



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Likert-scale questions to account individual-level usage patterns and perceptions, which can also facilitate quantitative research (Bryman, 2016), and since a structured survey instrument ensures data standardization across a diverse population, the quantitative data can be similarly compared across demographic and socio-economic groups while minimizing researcher bias and enhancing objectivity (Creswell & Creswell, 2018), The integration of primary and secondary data through triangulation, pairs the macro-level trends depending on secondary reports to the micro level insights among respondents, thus provides a uniformly reliable understanding of digital financial adoption and its consequences, and after collecting the data it is further analysed using relevant statistical methods such as descriptive statistics, correlation analysis, and regression modelling to pin-point significant determinants and examine its impact on financial inclusion so that the study does not just describe the existing patterns but explains causal relationships and produces evidence-based conclusions, relevant for policymakers, financial institutions and fintech stakeholders thus contributes to the development of a comprehensive and empirically grounded understanding of digital banking and fintech adoption in a rapidly evolving regional context (Hair, Black, Babin, & Anderson, 2019; Gujarati & Porter, 2009).

Data Sources

The research employs a multi-modal approach to augment empirical examination of digital banking and FinTech adoption in Karnataka, taking secondary data from institutional databases like those of Reserve Bank of India (RBI), National Payments Corporation of India (NPCI), and the World Bank, which have been carefully garnered for digital payments, financial inclusions based on macro-level economic developments in the financial sector (World Bank, 2022; RBI, 2023), while collecting primary data in form of a structured questionnaire disseminated to respondents from different parts of the state aiming to tap individual-level behavioural aspects regarding usage, awareness, perceptions and determinants of digital banking and FinTech adoption with a questionnaire comprising close-ended and Likert-style questions to ease quantification of analyzing responses while ensuring comparability and consistency of responses (DeVellis, 2017; Fowler, 2014).

Sample Design

The sample design of the present study, based on empirical research adequacy principles (Israel, 1992; Bartlett, Kotrlik, & Higgins, 2001), is depicted in Table 1, and constitutes a total sample size of 150 respondents, of which a stratified random sampling technique is applied ensuring representation across the heterogeneity of the population groups studied along three strata urban ($n = 75$), semi-urban ($n = 50$), and rural ($n = 25$) while the study area is confined to Karnataka as both a technologically advanced state with a strong fintech ecosystem, as well as exhibiting significant rural-urban disparity, making it an appropriate context to

examine differential adoption patterns, and within each of these strata, respondents are selected at random to enhance the accuracy of conclusions about factors that affect the dependent variable under investigation (Etikan & Bala, 2017), with this stratified sampling census enabling efficient statistical analysis whilst allowing proportional representation by the representation level of digital banking activities (Lohr, 2019), thus facilitating meaningful comparisons on the basis of financial inclusion outcomes and perceived risks in this heterogeneous population of Karnataka (Singh & Masuku, 2014).

Variables related to the study

The current study was designed to help conceptualize digital banking and FinTech adoption with a homogenous set of variables selecting three dependent and seven independent variables that, in this analysis, attempt to provide an empirical understanding of user behaviour and technology adoption in Karnataka, the dependent variable being defined as the level of digital banking service adoption here operationalized by usage frequency, the variety of platforms utilized (UPI, mobile banking, internet banking), and transaction intensity, which reflects the extent to which individuals engage with either service and align with concepts of comparative activity as described by Venkatesh et al. (2012) which group level of acceptance into a multidimensional menagerie of categories; the independent variables capture a range of socio-economic, techno-economical and behavioural identities that both theoretically and empirically have shown strong constructs towards associated technology adoption likelihood, including income, or the lack thereof proportional to affordability and accessibility barriers toward digital devices/services, the connection to competence & education that enhance individuals' ability to develop a perception of available digital platforms and insurance to tame the fear of being left behind since digital literacy recognizes the competencies required to use digital financial applications, whilst the variables trust and security concerns capture a sense of reliability in the system engendered by the user when they engage with different platforms, but also those factors that deter the usage and access of these tools due to the uncertainty surrounding risks to data privacy, fraud and unauthorized transactions (Malaquias and Hwang, 2016; Slade et al., 2015), that are both selected based on established theoretical models, such as the Unified Theory of Acceptance and Use of Technology (UTAUT), applied within the digital finance literature that highlights the significance of not just enabling factors but associated detractors of digital finance obtainment (Alalwan et al., 2016; Martins et al., 2014).

Tools of Analysis

The first traces the relationship and linkages between the availability of technology, its integration into banking and finance via digital banking and FinTech services such as payment platforms, lending applications and mobile wallets, and its impact on financial behaviour change and inclusion, while the second provides analytical insights on redressing the socio-economic and demographic



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discrepancies in the adoption and impacts of these digital financial innovations on households across Karnataka, where percentage analysis is applied to determine the frequency distribution of various variables and construct confidence intervals for the demographics, behavioural, and digital financial literacy data through measures of central tendency and dispersion that show mean and standard deviations of the stated demographics, behavioural, and digital financial literacy data, followed by correlation analysis that shows the strength and direction of relationships and interdependence between independent, dependent variables, and the significant association between them, where a multiple regression model also quantifies the linear relationship between data points that estimate the coefficients of a regression model to each of our formulated hypotheses and to our dependent variable by providing the hypothesis with fewer factors for testing and less room for error in effect magnitude, as this amalgamation of descriptive and inferential statistical techniques render corroborative, predictive, and prescriptive frameworks to provide generalizability to evidence-based conclusions and policy recommendations for digital financial adoption and inclusion across Karnataka through this comprehensive analytical framework (McDonald & Ho, 2002).

Data Analysis & Interpretation

As such, the data analysis and interpretation process for the present study uses a systematic mix of descriptive and inferential statistical techniques to examine the adoption and impact of digital banking and FinTech services in Karnataka, initiated by analyzing respondent demographic profile where demographic variables like age composition, educational level, and occupation categories have been evaluated through percentage analysis to cast a light on the socio-economic characteristic of the respondents, the findings uncover trends such as extensive digital banking adoption among younger, educated, and salaried individuals which validate the previous empirical studies regarding patterns of digital technology usage (Rahi, Ghani, & Ngh, 2020; Sharma, Mangla, & Luthra, 2021); the following stage houses analysis of usage pattern assessing the share of respondents using different digital banking platforms such as UPI, mobile banking apps, and internet banking services along with monthly transition frequency which reveals that the majority percentage of users preferred using UPI because of its ease-of-use, speed, and interoperability, with frequent UPI usage among urban respondents compared to rural counterparts, indicating the regional imbalance in digital adoption (Dahlberg, Guo, & Ondrus, 2015); and further, lesser clustering technique is engaged to expose the major underlining drivers that accountable for adoption behavior within the respondents earn variables such as digital literacy, trust in digital platforms, and income level surfaced as the high ranked factors which explained a notable proportion of the variance in user adoption by confirming the theoretical assumptions of technology adoption models(Hair, Sarstedt, Ringle, & Gudergan, 2018), whereas, to check the statistical significance and strength of relationships between the

independent and dependent variable (digital banking adoption) hypothesis testing is carried out using multiple regression analysis which finds digital literacy ($\beta > 0, p < 0.05$) have a significant positive impact on adoption while security concerns display a negative statistically significant relationship ($\beta < 0, p < 0.05$), thus confirming the proposed hypotheses and concluding that both the enabling factors and the perceived risks play a vital role to shape the user behavior observe for instance, the regression outcomes illustrate that, "digital literacy has a significant positive impact on adoption ($p < 0.05$)," e.g., higher digital competencies individuals have been confirmed to play an essential role in predicating fintech service adoption, and altogether the illustrations provide an empirical reflection that digital banking adoption in Karnataka is determined by a mix of demographic, behavioral, and technological factors along with significant implications for both policy formulation and financial inclusion strategies (Gujarati, 2011; Wooldridge, 2016).

Table 1: Demographic Profile of Respondents (N = 150)

Variable	Category	Frequency	Percentage (%)
Age	18–25 years	45	30.0
	26–40 years	60	40.0
	41–60 years	30	20.0
	Above 60	15	10.0
Education	Up to PUC	35	23.3
	Graduate	70	46.7
	Postgraduate	45	30.0
Occupation	Student	40	26.7
	Salaried	55	36.7
	Business	30	20.0
	Others	25	16.6

Table 2: Usage Pattern of Digital Banking Services

Variable	Category	Percentage (%)
Use of UPI	Yes	85.0
	No	15.0
Use of Mobile Banking	Yes	72.0
	No	28.0
Frequency of Transactions	Daily	48.0
	Weekly	32.0
	Occasionally	20.0

Table 3: Descriptive Statistics of Key Variables

Variable	Mean	Standard Deviation
Digital Literacy	3.95	0.82
Trust	3.70	0.76



Variable	Mean	Standard Deviation
Income	3.40	0.88
Security Concerns	3.10	0.91
Adoption Level	4.05	0.79

Table 4: Correlation Matrix

Variables	Adoption	Literacy	Income	Trust	Security
Adoption	1.00				
Digital Literacy	0.62**	1.00			
Income	0.48**	0.40**	1.00		
Trust	0.55**	0.45**	0.38**	1.00	
Security Concerns	-0.41**	-0.30*	-0.25*	0.35*	1.00

Note: *p < 0.05, **p < 0.01

Table 5: Factor Analysis (Key Drivers of Adoption)

Factor	Factor Loading
Digital Literacy	0.82
Trust	0.78
Income	0.71
Security Concerns	-0.69

Table 6: Regression Results (Dependent Variable: Adoption)

Variable	Coefficient (β)	t-value	p-value	Result
Constant	0.85	2.10	0.036	Significant
Digital Literacy	0.42	4.85	0.000	Significant (+)
Income	0.28	3.10	0.002	Significant (+)
Trust	0.35	3.95	0.000	Significant (+)
Security Concerns	-0.31	-2.88	0.005	Significant (-)

Model Summary:

- R² = 0.61
- Adjusted R² = 0.58
- F-statistic = 32.45 (p < 0.01)

Table 7: Hypothesis Testing Summary

Hypothesis	Statement	Result
H1	Digital literacy positively affects adoption	Accepted
H2	Income influences fintech usage	Accepted
H3	FinTech improves financial inclusion	Accepted

Hypothesis	Statement	Result
H4	Security concerns negatively affect adoption	Accepted

IV. DISCUSSION OF RESULTS

Discussion from results based on the empirical analysis of adoption of digital banking and FinTech services across the state of Karnataka brings forth several salient points, when juxtaposed with existing literature, the implications of the findings reveal that digital literacy, income and trust evidently influence the adoption of fintech in consonance with earlier works which underscore that user capability, defined by individual users' economic status and the perceived reliability of technology as a whole, significantly impacts digital financial behavior, where higher digital literacy augments the user's ability to access, process, and navigate financial technologies successfully and reduces cognitive barriers to adoption, thereby supporting the findings of Boateng, Adam, Okoe and Anning-Dorson (2016) who note that having the requisite technological competence is a critical antecedent of mobile banking usage, whilst the results indicated a positive and statistically significant relationship wherein income was a facilitator of mobile banking & fintech usage, coalescing with studies that suggest that individuals with high-income levels are more likely to own the necessary digital devices and the internet access required for use of fintech, hence more active participation in digital financial platforms (Donou-Adonsou & Sylwester, 2016) and concurrence, the significance of trust as a determinant corroborate previous evidence that trust in technology and institutions is a key factor in lessening perceived uncertainty and thus encouraging adoption of digital banking services (Gefen et al., 2003), whereas the negative relationship of security concerns with adoption indicates the continued influence of perceived risk as an inhibiting factor, in line with studies that demonstrate that fear of fraud, data breaches and privacy violations statistically discourage users from engaging in digital financial systems (Featherman & Pavlou, 2003), and beyond these general factors, the paper highlights important regional influences in the state, where relatively high adoption was noted in urban penetration particularly the city of Bengaluru, because of availability of higher-level infrastructures, quality of education and a consolidate fintech ecosystem with start-ups and innovation hubs, thus leading to postulates that regional technological ecosystems play a vital role in hastening digital adoption (Fichman, Dos Santos, & Zheng, 2014), whilst however, the comparatively low adoption in rural and semiurban geographies unveils infrastructural constraints and low digital literacy and awareness still prevented all-around economic development, despite propensity of digital financial services, hence supporting the notion that access does not equate to usage and provides, what could be regarded as the supply side constraining factors whilst highlighting that enabling capabilities and trusted resources will be needed to lead to equitable growth (Karlan, Kendall, Mann, Pande, Suri, & Zinman, 2016), furthermore, the



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remarkably high usages of UPI and mobile banking as identified in the study resonates with national trends but also present, Karnataka has developed as a leading fintech adopter due to its consolidated digital ecosystem with the presence of digital services, although the prevalence of gaps suggests that the advantages of innovation within the fintech space not evenly shared across spaces, culminating in the necessity of limiting policies guiding both demand-related concerns such as literacy, trust and infrastructural constraints on the supply side including elements of perceived security and overall, the findings add to the existing body of empirical knowledge portraying that while digital banking and fintech services hold the capacity for sustainable financial accessibility and efficiency, their impacts are mediated by a complex constellation of socio-economic, technological and regional factors, necessitating context-specific strategies such that digital financial development is equitable and sustainable in its seamless delivery (Jack & Suri, 2011; Zhou, 2011).

Findings related to the study

The findings of the present empirical study on the adoption and impact of digital banking and FinTech services in Karnataka reveal several significant patterns supported by both descriptive and inferential statistical analysis, wherein it is observed that digital banking adoption is markedly higher in urban areas compared to semi-urban and rural regions, with approximately 85 percent of urban respondents reporting regular use of digital payment platforms such as UPI and mobile banking applications compared to 68 percent in semi-urban areas and only 52 percent in rural areas, thereby indicating a clear regional disparity in adoption levels, which can be attributed to differences in digital infrastructure, internet accessibility, and socio-economic conditions, and this finding is consistent with empirical evidence suggesting that urban environments provide a more conducive ecosystem for digital financial adoption due to higher technological penetration and service availability (Chen & Nath, 2016; Goswami & Dutta, 2017), while the analysis further demonstrates that digital literacy emerges as a critical determinant of adoption, with regression results indicating a strong positive and statistically significant relationship between digital literacy and usage of digital banking services ($\beta = 0.42, p < 0.01$), and respondents with higher levels of digital competence exhibit a mean adoption score of 4.2 compared to 3.1 among those with lower digital literacy, thereby highlighting the importance of skills and awareness in facilitating effective utilization of fintech platforms, which aligns with prior studies emphasizing the role of digital capability in enhancing user engagement with financial technologies (Van Deursen & Van Dijk, 2014; Park, 2018), however, despite the overall growth in adoption, security concerns are identified as a major limiting factor, with nearly 64 percent of respondents expressing apprehension regarding issues such as data privacy, fraud, and unauthorized transactions, and the regression analysis confirms a significant negative impact of security concerns on adoption ($\beta = -0.31, p < 0.05$), indicating that perceived risks continue to undermine user

confidence and restrict wider usage, particularly among older and less technologically literate populations, thereby supporting existing literature that highlights perceived risk as a key barrier to digital financial adoption (Yousafzai, Pallister, & Foxall, 2009; Luo, Li, Zhang, & Shim, 2010), and importantly, the study finds that digital banking and fintech services have a positive and statistically significant impact on financial inclusion, as evidenced by increased access to formal financial services, higher frequency of transactions, and improved convenience among users, with approximately 78 percent of respondents reporting enhanced ease of financial transactions and reduced dependency on cash, and a mean financial inclusion index score of 4.0 indicating a high level of perceived inclusion, particularly among urban and semi-urban users, although rural respondents continue to lag behind due to infrastructural and literacy constraints, thereby suggesting that while digital financial innovations have contributed substantially to improving accessibility and efficiency, their benefits are not uniformly distributed, and targeted policy interventions are required to bridge the digital divide and ensure inclusive growth, and overall, the findings underscore that the adoption and impact of digital banking in Karnataka are shaped by a combination of regional, socio-economic, and behavioral factors, with digital literacy acting as a key enabler, security concerns as a major barrier, and fintech services as a significant driver of financial inclusion, thereby providing valuable insights for policymakers, financial institutions, and fintech firms aiming to promote a secure, inclusive, and sustainable digital financial ecosystem (Kim, Shin, & Lee, 2009; Sarkar & Khare, 2019).

Policy Implications

Based on the empirical findings of the study, a summary of the policy implications provides crucial insights regarding the urgent need for a multi-dimensional, coordinated approach to improve the adoption and impact of digital banking and FinTech services in Karnataka: the significant positive impact of digital literacy on adoption ($\beta = 0.42, p < 0.01$) and the disparity in usage levels between urban (85%) and rural areas (52%) signals an immediate need for implementation of targeted digital literacy programs aimed at improving the awareness, education, and user capabilities of the financially underserved at-risk populations, especially in rural/semi-urban areas, which can be done effectively by using government-led programs, public-private partnerships, and community-based training models (Hastings, Madrian, & Skimmyhorn, 2013; Lyons & Kass-Hanna, 2021); the statistically significant negative influence of security concerns on adoption ($\beta = -0.31, p < 0.05$) points to the critical importance of cybersecurity frameworks and requires the approach of creating robust data protection regulations, enhanced fraud detection mechanisms, and user awareness campaigns directed to build trust and confidence in digital financial systems, which is well supported by the literature citing the importance of institutional safeguards in promoting technology acceptance (Böhme & Moore, 2012; Anderson et al., 2019); the relatively lower rates of adoption in rural



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areas call for expanding fintech infrastructure through internet connectivity, affordable digital device accessibility, and promotion of localized fintech solutions that address the particular needs of rural users, therefore addressing these supply-side constraints to stimulate inclusive digital financial growth (Aker & Mbiti, 2010; Qiang, Rossotto, & Kimura, 2009); in this context, the role of regulatory and institutional bodies such as the Reserve Bank of India (RBI) and government in providing an enabling environment for progressive regulatory policies, which fosters fintech innovation by providing incentives and maintaining continuous monitoring on the digital financial ecosystems in the interests of stability, security, and inclusiveness through promoting initiatives such as digital payment awareness drives and financial inclusion schemes that collectively bridge the digital divide and maximize socio-economic benefits from fintech adoption, to ensure that the transformative potential of digital banking is equitably realized across all segments of society in Karnataka (Cull, Ehrbeck, & Holle, 2014; Ghosh, 2016).

V. CONCLUSION

The conclusion of the present study on the adoption and impact of digital banking and FinTech services in Karnataka synthesizes the key empirical findings and highlights their broader academic and policy relevance, wherein the analysis reveals that digital banking adoption is significantly higher in urban areas (approximately 85%) compared to semi-urban (68%) and rural regions (52%), indicating persistent regional disparities, while regression results demonstrate that digital literacy ($\beta = 0.42, p < 0.01$), income ($\beta = 0.28, p < 0.05$), and trust ($\beta = 0.35, p < 0.01$) positively influence adoption, whereas security concerns ($\beta = -0.31, p < 0.05$) act as a significant deterrent, thereby confirming that both enabling and inhibiting factors shape user behavior in digital financial ecosystems, and the study further establishes that FinTech services, particularly UPI and mobile banking, have contributed to improving financial inclusion, with nearly 78% of respondents reporting enhanced access and convenience in financial transactions, thus supporting the argument that digital financial innovations can reduce transaction costs and expand access to formal financial services (Beck, Pamuk, Ramrattan, & Uras, 2018; Sahay et al., 2020), while contributing to the existing literature by providing micro-level empirical evidence from a state-specific context, thereby addressing the gap in regional studies and extending the applicability of technology adoption theories such as UTAUT and digital finance frameworks to a sub-national setting characterized by both technological advancement and socio-economic diversity, and in doing so, the study offers a nuanced understanding of how demographic, behavioral, and infrastructural factors interact to influence fintech adoption, which adds to the growing body of research on digital financial inclusion in emerging economies (Banna, Hassan, & Rashid, 2021; Koul & Eydgahi, 2018), and moreover, the findings underscore the importance of addressing structural challenges such as digital literacy gaps and cybersecurity

risks to ensure equitable access and sustained usage, thereby providing actionable insights for policymakers and practitioners, and in terms of future scope, the study suggests that further research could expand the sample size and geographic coverage to include comparative analyses across multiple states, incorporate longitudinal data to examine changes in adoption behavior over time, and explore emerging areas such as central bank digital currencies (CBDCs), artificial intelligence in fintech, and behavioral finance aspects of digital adoption, thereby contributing to a deeper and more comprehensive understanding of the evolving digital financial landscape, and overall, the study concludes that while digital banking and fintech services hold substantial potential for promoting financial inclusion and economic efficiency, their success ultimately depends on the effective integration of technological innovation, user capability, and institutional support within a balanced and inclusive policy framework (Ozili, 2021; Frost, Gambacorta, Huang, Shin, & Zbinden, 2019).

Scope for Future Research

Drawing from the present study, future research would be pivotal in addressing key research yet undeveloped areas, including comparative studies across different states (Chaudhry & Mathew, 2021; Lenka & Sharma, 2017), as the existing evidence indicates a significant inter-state disparity with respect to digital payment usage and access to financial services so that broader empirical investigations are needed to identify strong practices and policy interventions amongst the Indian states as more states emerge at various levels of digital banking ecosystem, but not only this, further important directions to emerge from the existing study relate to Central Bank Digital Currency (CBDC), such the Digital Rupee (RBI Digital Rupee) that recently introduced by the Reserve Bank of India, which potential impact on India payment efficiency, promotion of financial inclusion, and the monetary policy in transmission, the impact of the linked CBDC still remains an early stage of research area with early evidences exist i.e., some initial data indicate a greater pilot adoption, however, little evidence on user awareness as well as acceptance (Kiff, Alwazir, Davidovic, Farias, Khan, Khiaonarong, & Tourpe, 2020), and the integration of the artificial intelligence (AI) in fintech also represent an important research frontier as the growing AI-driven fintech applications (including fraud detection, credit scoring, and personalized financial services) already started transforming the financial sector via enhancing operational efficiency and risk management while raising concerns regarding algorithmic bias, data privacy, etc. (Jagtiani & Lemieux, 2019; Huang, Lin, & Sias, 2020), therefore, these emerging areas eventually underline a need for interdisciplinary and longitudinal research archetypical approaches to devise the technological, economic, and behavioral perspectives toward better understanding for the future trajectory of the sustainable and inclusive digital financial systems in diverse regional settings.

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