

A STUDY ON ENHANCING FINANCIAL CONSUMER PROTECTION THROUGH TECHNOLOGICAL INNOVATIONS AND DIGITAL SECURITY MEASURES: INSIGHTS FROM COMMERCIAL BANKS IN KOLAR DISTRICT

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ABSTRACT

In today's increasingly digitized banking landscape, ensuring the security and protection of financial consumers has emerged as a critical priority for commercial banks worldwide. This imperative is particularly pronounced in light of the escalating threat posed by cybercrime and data breaches. In response to these challenges, commercial banks have been proactively harnessing technological innovations and implementing robust digital security measures to safeguard the financial interests of their customers.

One of the key strategies adopted by commercial banks is the deployment of cutting-edge encryption protocols and multi-factor authentication systems to fortify their digital platforms. These measures not only secure sensitive financial data but also provide customers with enhanced control over their accounts and transactions, thereby bolstering confidence in online banking services.

Moreover, commercial banks are increasingly investing in advanced fraud detection and prevention technologies, such as artificial intelligence and machine learning algorithms. These tools enable banks to analyze vast volumes of transactional data in real-time, swiftly identifying and mitigating suspicious activities before they escalate into fraudulent incidents. By leveraging predictive analytics and behavioral biometrics, banks can proactively detect anomalies and authenticate user identities, thereby thwarting potential cyber threats.

Furthermore, recognizing the pivotal role of consumer education in fostering digital literacy and awareness, commercial banks are actively engaging in outreach initiatives to educate customers about cybersecurity best practices. Through interactive workshops, online tutorials, and informational campaigns, banks aim to empower consumers with the knowledge and skills necessary to safeguard their financial assets in an increasingly interconnected digital ecosystem.

Collaboration and partnership with cybersecurity experts and regulatory authorities also play a crucial role in strengthening banks' resilience against emerging cyber threats. By sharing intelligence, best practices, and industry insights, banks can enhance their cyber defense capabilities and stay ahead of evolving cybercrime trends.

Adoption of new technological innovations and digital security measures represents a proactive and multifaceted approach by commercial banks to enhance financial consumer protection. By leveraging cutting-edge technologies, fostering digital literacy, and fostering

collaborative partnerships, banks can fortify their defenses against cyber threats and instill greater confidence and trust among their customer base in an era of rapid digital transformation.

Keywords: cybersecurity experts, cyber threats, cybercrime trends., fostering digital literacy, societal issue.

INTRODUCTION:

Commercial banks serve as vital institutions within the financial ecosystem, playing a multifaceted role in facilitating economic growth and development. (Ozili and Rachid, 2023), Beyond traditional banking functions, commercial banks are increasingly leveraging innovation to enhance consumer services, thereby addressing evolving customer needs and preferences in an ever-changing market landscape (Abeysiriwardana and Jayasinghe, 2022).

At the forefront of this innovation is the adoption of digital technologies to streamline banking operations and deliver seamless, user-centric experiences. (Yoganandham, 2024). Through the development of intuitive mobile banking applications and online platforms, commercial banks are empowering consumers with greater convenience and accessibility to financial services. From account management to fund transfers and bill payments, these digital channels enable customers to conduct transactions anytime, anywhere, at their convenience (Sharma et al., 2021).

Moreover, commercial banks are exploring emerging technologies such as artificial intelligence (AI), machine learning, and data analytics to personalize services and anticipate customer needs proactively (Fares and Butt, 2022), By leveraging AI-driven chatbots and virtual assistants, banks can provide real-time assistance and support to customers, enhancing engagement and satisfaction levels. Additionally, data analytics enables banks to gain deeper insights into customer behavior and preferences, (Ghandour,2021) allowing for targeted product recommendations and personalized financial advice.

Furthermore, commercial banks are embracing innovation in product offerings to cater to the diverse needs of consumers. From innovative savings and investment products to tailored lending solutions, (Elebe , and Imediegwu,, 2021). banks are continuously introducing new products and services designed to meet the evolving financial goals and aspirations of their customers. For instance, digital lending platforms leverage AI algorithms to streamline loan approval processes and offer competitive interest rates, making (Sadok et al., 2022) borrowing more accessible and transparent for consumers.

Collaboration and partnerships with fintech startups and technology providers also play a crucial role in driving innovation in consumer services. (Alaassar, 2023), By tapping into the expertise and agility of fintech firms, commercial banks can accelerate the development and deployment of innovative solutions, ranging from peer-to-peer payment platforms to robot-advisory services.

LITERATURE REVIES AND HYPOTHESIS

Technological and institutional factors influencing Finical consumer protection

Digital technology provides quick and easy access to various digital services, it leads for opportunity and challenges in dealing with customers money management (Koskelainen et.al., 2023). The rapid growth and emerging technological trends in e-commerce changed drastically consumer preference to buy online and use techno-based services offered by the commercial banks. The present Indian legal system is offering legal protection to the online users (Chawal and Kumer, 2022). Fin tech applications like mobile services, builds resilience

at any time use especially at pandemic experienced at first time brought economic resilience among the Bangladeshi users (Nagger and Uddin, 2020). Wireless serves have been preeminent used in Asian counities offers significant opportunity in value added services (Ho et al., 2020). Commercial banks in the digital era, adjust themselves to give flexible banking services with quick, safe and anywhere digital services (Usanti and Setiawati, 2024). Technology, financial innovations and deeper integration of technology lead for positive impact on commercial banks productivity. (Zuo et al., 2023). Internet banking, teller machine, Mobile banking and credit cards increases the profitability of commercial banks (George 2022). Digital financial services offer reasonable, secure banking services to the underprivileged in the developing countries through technologies, digital platforms and electronic transactions. (Rana et al., 2020). Local bank's branches and digital services substitute the alleviation of financial constraints, digital financing technology influences traditional small medium enterprises and bank relationship for managerial implications. (Lu et al.2022). evaluation of financial technology with digital consumer behaviour at the present scenario re-modelling conventional financial business models for increasing financial inclusion model to the Generation Z. (Kangwa et al., 2021).

TECHNOLOGICAL INNOVATIONS AND ACTUAL CONSUMER PROTECTION OUTCOMES

Digital technology is used to foster consumer policy objectives and significantly contributes for attaining priority of consumers policy outcomes such as consumer protection, empowerment and rights of enforcement. (Thorum and Diels, 2020). Financial products and services in the digital age aims for elucidating the transformative impact on digitalization in the financial landscape. The significant surge in adoption of technology driven by technological innovation, changing consumer preference, and regulatory framework. digital finance focuses on convenience, accessibility and efficiency while also facing challenges related to cybersecurity, data privacy (Muslim, 2024). Digitization and ICT revolution deepened financial innovations as new contributors in fin Techs and technology companies. The advancement provides increased product services and non- conventional new entrants and adopts new business models for leveraging strong financial inclusion initiatives (Jameaba and Ssenyonga, 2022). Digitalization with the generalization and unsystematic access to internet paves the way for revolutionary progress in the financial industry. The extreme flexibility and globalized financial services revolutionize technology and introduce opportunities for the continuous adoption of financial policies in the institutions (Stanescu, 2021).

Signle market and EU development and new approach coordinates work and standardize the development for reducing technical barriers to trade in the intent market. (winn and Jondet, 2008). Commercial banks adopt online services to stay competitive and fulfill the customers expectations. The immediate need for adoption is to convenience online customers. The ES-QUL model adopted recommends to the banking industry to develop effective strategies (Ahmed et al, 2020).

Financial technology innovation brought indispensable impact on banking business and risk management. Though challenges are being faced by banks in security and regulatory compliances, technical modernization and business reforms have opened new paradigm shift in tackling risks. Fintech enhances competitiveness and strengthening internal capacity building external cooperation for coping with complex marketing scenario (Baw et al., 2024).

Finance and other allied sectors provide valuable insights for dynamic financial technology and far-reaching implications for traditional sectors. It influences advancement in AI driven

solutions, user adoption and behaviour, regulatory environment to provide better financial inclusion. (Reddy and Kumar, 2020).

H1: Digital financial literacy has a significant positive impact on financial consumer protection.

H2: cybersecurity infrastructure has a significant positive impact on financial consumer protection.

H3: Regulatory framework strength has a significant positive impact on financial consumer protection.

H4: Data privacy measures have a significant positive impact on financial consumer protection.

H5: fin Tech innovation has a significant positive impact on financial consumer protection.

H6: Transparency in Digital transactions has a positive impact on financial consumer protection.

H7: Consumer trust in digital transactions has a positive impact on financial consumer protection.

H8: grievance redressal mechanisms have a positive impact on financial consumer protection.

Technological innovations and actual consumer protection outcomes

H9: The adoption of digital security practices has a significant positive impact on the effectiveness of the redressal mechanisms.

H10: The adoption of digital security practices has a significant positive impact on the effectiveness of the consumer trust in digital transactions.

H11: The adoption of digital security practices has a significant positive impact on the effectiveness of the transparency in digital transactions.

H12: The adoption of digital security practices has a significant positive impact on the effectiveness of the digital financial literacy

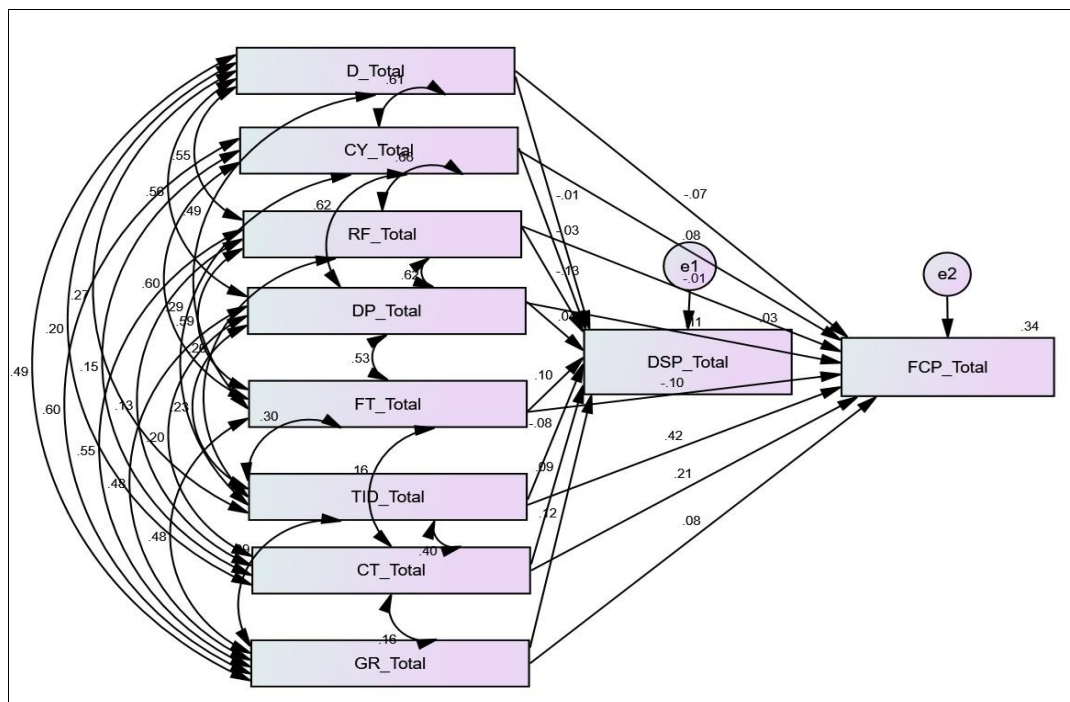
H13: The adoption of digital security practices has a significant positive impact on the effectiveness of the cyber security infrastructure.

H14: The adoption of digital security practices has a significant positive impact on the effectiveness of the Regulatory framework strength.

H15: The adoption of digital security practices has a significant positive impact on the effectiveness of the fin Tech Innovations.

H16: The adoption of digital security practices has a significant positive impact on the effectiveness of the data privacy Measures.

Figure 1. Pathe diagramme of consumer protection through Technological innovations and Digital Security measures.



The adoption of digital security practices has a significant positive impact on the effectiveness of grievance redressal mechanisms.

Analysis - Enhancing Financial Consumer Protection through Technological Innovations and Digital Security Measures:

Table 1 demographic profile of the consumer

		Percentage (N=346)
Gender	Male	67.6
	Female	32.4
Age	21-30	15.0
	31-40	30.0
	41-50	43.0
	Above 50 years	12.0
Education	Lower level	20.0
	Middle level	30.0
	Higher level	35.0
	Others	15.0
Occupation	Business men	23.0
	Professionals	27.0
	Salaried	35.0
	Others	15.0
Banks Accounts maintained	Private	45.0
	Public sector	43.0
	Others	12.0
Technology used	Mobile banking	18.0
	Internet banking	14.0

	UPI (GPay, PhonePe, Paytm)	24.0
	Debit / Credit Cards	34.0
	NEFT / RTGS / IMPS	10.0

The demographic profile of the respondents defies that male- dominated with a strong representation of middle- aged belongs to 41-50 years, indicating mature and financial active users of banking services. A higher portion of respondents possess middle to higher levels of education to 35%, which supports better awareness and adoption of technology-enabled financial protection services. Salaried employees and professionals from the major 35%, occupational groups suggesting sable income users who actively rely on digital banking for secure transactions. The near-equal preference for private and public sector banks 45.0 %, and 43.0% reflects trust in technology-based innovations across both baking segments, Debit and credit cards 34.0%, along with UPI 24.0% payments platforms emerge as the most widely used technologies, highlighting the role of cashless payment systems in enhancing transactions security. Mobile and internet banking usage further shows growing reliance on 24X7 and anywhere access to protected banking services. In overall, the findings suggests that technology innovation and modernization significantly strengthen the financial protection by enhancing accessibility.

Measurement model for - Consumer Protection through Technological Innovations:

In order to establish the reliability, outer loadings were measured to found that all the variables were greater than then the cut-off 0.70 (Hanafiah,2020), it is confirmed that each indicator's reliability was greater than the 0.70 criterion to guarantee the dependability of the indicators (Goretzko et al., 2024) we calculated the average extracted variance (AVE), for every construct to identify the convergent validity. as shown in the table 2, we identified that every AVE value was greater than the appropriate point of 0.5, indicating that the measures successfully converged and faithfully represented the intended constructs as defied by the standards.

Table 2. construct reliability and convergent validity

Construct	Standardized factor loading	Cronbach Alpha	Composite Reliability	AVE
Digital financial Education	0.648	0.766	0.768	0.526
	0.744			
	0.779			
Cyber security support	0.703	0.752	0.753	0,504
	0.744			
	0.681			
Regulatory frame work	0,679	0.734	0.755	0.519
	0.802			
	0.529			
Data privacy policy	0.641	0.70	0.70	0.501
	0.672			
	0.660			
FinTech Innovation	0.737	0.815	0.818	0.600
	0.835			
	0.749			
Transparency in Digital Transactions	0.679	0.734	0.755	0,519
	0.902			

	0.529			
Consumer Trust in Digital Platforms	0.556	0.769	0.780	0.549
	0.780			
	0.853			
Grievance Redressal Mechanisms	0.556	0.769	0.780	0.549
	0.780			
	0.853			
Digital Security Practices Adoption	0.640	0.741	0.751	0.504
	0.817			
	0.660			
Financial consumer protection	0.658	0.731	0.732	0.476
	0.688			
	0.722			

Discriminant validity

Composite reliability (CR), measures the internal consistency of the construct, similar to Cronbach's alpha value, but more suitable for Structural equation model, CR value more than 0.70 indicated good reliability of the measurement model or outer model.

Here no validity concerns because, implies that all constructs satisfy that is Construct validity CR > 0.70, AVE>0.50 and AVE >MSV and Acceptable MaxR (H) values confirms both convergent and discriminate validity

Regression weights: Enhancing Financial Consumer Protection through Technological Innovations and Digital Security Measures

			Estimate	S.E.	C.R.	P	Label
FCP_Total	<---	D_Total	-.071	.064	-1.110	.267	par_1
FCP_Total	<---	CY_Total	.089	.074	1.202	.229	par_2
FCP_Total	<---	RF_Total	-.014	.067	-.216	.829	par_3
FCP_Total	<---	DP_Total	.125	.073	1.707	.088	par_4
FCP_Total	<---	FT_Total	-.094	.053	-1.755	.079	par_5
FCP_Total	<---	TID_Total	.470	.056	8.365	***	par_6
FCP_Total	<---	CT_Total	.217	.051	4.256	***	par_7
FCP_Total	<---	GR_Total	.082	.056	1.455	.146	par_8
DSP_Total	<---	GR_Total	.124	.072	1.724	.085	par_37
DSP_Total	<---	CT_Total	.104	.065	1.612	.107	par_38
DSP_Total	<---	TID_Total	-.089	.071	-1.252	.211	par_39
DSP_Total	<---	D_Total	-.011	.081	-.137	.891	par_40
DSP_Total	<---	CY_Total	-.038	.095	-.398	.691	par_41
DSP_Total	<---	RF_Total	-.141	.085	-1.668	.095	par_42
DSP_Total	<---	FT_Total	.098	.068	1.449	.147	par_43
DSP_Total	<---	DP_Total	.050	.093	.540	.589	par_44

DISCUSSION

The above result of the path analytical diagramme shows that financial consumer protection FCP, is significantly influenced by Trust in digital platforms and consumer Transparency shows strong positive effects with high significant P-Value is less than 0.000 (< 0.000). other factors such as Digital Literacy , cyber-Awareness, Risk factors , digital practices, Financial Technology uses and Grievance Redressal do not show statistically significant impact on

financial consumer protection, since their P-Value exceeds the cut off value of 0.05. but Digital practices and financial Technology usage show marginal effects at the 10% level, these relationships are not strong enough to confirm significance .

With respect to the digital security practices, none of the explanatory variables, demonstrate a statistically significant influence at the 5% level of significant. However, the grievance Redressal and Risk factors show marginal significance at the 10 % level of significance, suggests a weak but potential association with digital Security practices.

The findings highlights that trust and transparency play a predominant the role in strengthening financial consumer protection, while the determinants of digital security practices appear to be more complex and less directly influence by the studied variables.

Implications for the study: This study more reliable adds to the concept of enhancing financial protection through Technology innovations and digital security measures, the proposed conceptual model is based on integrated theoretical farmwork, conceptualised with the help of technology acceptance model, protection of motivation theory, institutional theory and trust theory and this is empirically embedded by using structural equation modelling. This study advocates the importance of consumers protection in the innovative digital technology. The financial consumer protection is largely contributed through transparency and digital trust, the consumers are protected with transparent transactions, trust builds with the banking products and services.

The further trust building is improved with creating trust on other important services like cybersecurity infrastructures, regulatory frame works, data privacy, fin tech innovation, Grievance redressal Mechanisms.

The high financial consumer protection mechanism, combining with technological innovation as strong digital security measures, facilitates the design of tailored programmes that provide gender specific and technology- specific support, thereby enhancing the delivery of secure banking services.

CONCLUSION

The findings of the study contradict that the combined assumptions of technology acceptance, protection of motivation institutional and trust theories. Which holds that transparency and financial consumer protection plays significant role in enhancing financial consumer protection with the help of technology innovations and digital security measures. This suggest that other variables such as cyber security, regulatory framework strength, data privacy measures, fin Tech Innovation, Transparency in Digital Transactions, consumer trust in digital transactions and grievance redressal mechanisms, may play important role in providing consumer protection for financial services. Among the other variables such as consumer trust in digital transaction, transparency in digital Transactions , digital financial literacy, cybersecurity infrastructure, and Regulatory framework has direct and indirect relationship with access to financial services through mediation of digital security protection by the commercial banks.

LIMITATION OF THE STUDY

The study is restricted to the Kolar districts alone; the result may not reflect the large Indian commercial banks offering consumer protection through technological innovations and digital security measure at the different parts of the country. Since the study is focusing on the only on consumer protection with the help of innovations and digital security measures other tractional services offered is ignored. Furthermore, the cross-sectional design used limits the capacity of determining causality and monitors the consumer network behaviour in

accessing the services. A longitudinal approach might provide opportunity to observe repeatedly over an extended period of time and provide insightful information about the variables used for financial consumer protection. The would be more reliable , applicable and cross-cultural as extended to large geographical area in India.

Authors contributions

Ms Reena and Dr. Saravanan conceived the idea and developed the quantitative design to undertake an empirical study Ms Reena extracted highly innovative papers for review of literature, and filtered them based on the basis of key words, concepts and codes matching for the design of the study. Dr. Saravanan did analysis and verified the methods and guided the study . the data were collected by the MS. Reena, and who performed the statistical analysis and it is verified by Dr. Saravanan. Ms. Reena, wrote the initial draft and finally both the authors redrafted the modified the manuscripts.

Conflict of interest

The authors are acknowledging that they did not have any affiliations with or involvement in any organisation or entity for financial interest and material discussion in the manuscript.

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Ethical statement

This research is carried out exclusively for doctoral study, received ethical clearance from KMG college of arts and science for approval and stringent adherence to ethical standards was observed through the complete study. The consent is received from all the participants with the form designed to receive comprehensive details applicable to the study.

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