



Original Article

Integrating Digital Technologies and Digital Finance for Achieving Sustainable Development Goals: A Study of Karnataka

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Abstract

The integration of digital financial systems has made digital transformation a major force behind sustainable growth. This study looks at how digital financial services and technology help Karnataka to achieve the Sustainable Development Goals (SDGs). Both primary and secondary data serve as the foundation for the study. A systematic questionnaire on digital technology use, financial inclusion, and sustainability consciousness was used to gather primary data from 120 respondents. Cronbach's Alpha was used to measure reliability, and the results showed good internal consistency (0.82). SPSS was used to apply sophisticated statistical techniques including correlation, regression, and mediation analysis. The findings show that digital technology adoption, digital financial inclusion, and sustainable development are all significantly positively correlated. The study emphasises how technology and sustainability effects are mediated by digital finance. It concludes that equitable and sustainable development may be further enhanced by bolstering digital infrastructure, literacy, and security.

Keywords: Digital Transformation, Digital Financial Inclusion, Sustainable Development Goals (SDGs), Financial Technology, Digital Payments, Financial Inclusion

Introduction

India's financial and economic systems have undergone substantial change as a result of the quick development of digital technology. Digital transformation has expedited the adoption of digital financial services like mobile banking, UPI, and fintech platforms in Karnataka, a state renowned for its robust technology environment. These developments have been essential for increasing financial access and boosting economic engagement.

In order to accomplish the Sustainable Development Goals (SDGs) set forth by the UN, digital finance has emerged as a crucial instrument. By offering easily available and effective financial services, it helps to eliminate poverty, promote economic growth, and lessen inequality. Improved financial management and lower transaction costs are advantageous to individuals, small enterprises, and entrepreneurs. Notwithstanding these developments, problems including cybersecurity threats, digital illiteracy, and unequal infrastructure still persist. Examining digital technology integration with financial institutions in the perspective of sustainable development is necessary. This study uses empirical data and sophisticated statistical analysis to examine how digital technology and digital finance contribute to Karnataka's attainment of the SDGs.

Research Methodology

Using both primary and secondary data, the study employs a descriptive and analytical research approach. A systematic questionnaire was used to gather primary data from 120 respondents in Karnataka. Professionals, small company owners, and students were among the responders. The convenience sampling method was applied. Likert-scale elements evaluating digital technology adoption, digital financial inclusion, and sustainability outcomes made up the questionnaire. Journals, reports, and institutional publications were the sources of secondary data. Cronbach's Alpha was used to assess the data's reliability; the result was a value of 0.82, suggesting strong internal consistency. SPSS software was used to analyse the data. Advanced statistical techniques were used, including mediation analysis, multiple regression, Pearson correlation, and ANOVA. Through digital finance, the mediation model investigated the indirect connection between digital technology and sustainable development.

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For statistical testing, the sample size of 120 is sufficient and guarantees a meaningful interpretation of the findings. The direct and indirect linkages between digital technology, digital financial inclusion, and sustainable development were investigated using Structural Equation Modelling (SEM) in addition to correlation and regression analysis.

Objectives of the Study

1. To analyze the adoption of digital technologies in Karnataka.
2. To examine the level of digital financial inclusion among users.
3. To evaluate the impact of digital finance on sustainable development.
4. To study the mediating role of digital finance between technology and sustainability.

Hypotheses of the Study

Hypothesis 1 -

H0: Digital technology adoption has no significant impact on digital financial inclusion.

H1: Digital technology adoption significantly influences digital financial inclusion.

Hypothesis 2 -

H0: Digital financial inclusion has no significant impact on sustainable development.

H1: Digital financial inclusion significantly contributes to sustainable development.

Reliability Test (Cronbach's Alpha)

Scale / Variable	No. of Items	Cronbach's Alpha	Standardized Alpha	Mean Score	Std. Deviation
Digital Technology Adoption	5	0.79	0.80	3.84	0.62
Digital Financial Inclusion	5	0.83	0.84	3.76	0.58
Overall Scale (Combined)	10	0.82	0.83	3.80	0.60

Cronbach's Alpha is a widely used measure of internal consistency. The scale's excellent dependability is shown by the overall alpha value of 0.82, which is higher than the acceptable threshold of 0.70. Strong internal consistency is also supported by the sub-scale results for digital technology adoption (0.79) and digital financial inclusion (0.83).

All items contribute significantly to the scale, as seen by item-total correlations that vary from 0.57 to 0.70, which are higher than the lowest allowable threshold. Furthermore, the "alpha if item deleted" values show no improvement, indicating that all items ought to be kept.

The findings attest to the instrument's dependability, consistency, and suitability for additional statistical analysis, such as regression, correlation, and mediation analysis.

Hypothesis Testing and Interpretation

Correlation Analysis (Preliminary Evidence)

Variables	Digital Tech	Digital Finance	Sustainability
Digital Technology	1	0.71**	0.64**
Digital Finance	0.71**	1	0.69**
Sustainable Development	0.64**	0.69**	1

(**p < 0.01)

All of the variables have significant positive connections, according to the correlation matrix. Digital technology and digital finance have a strong correlation ($r = 0.71$), indicating that growing use of digital financial services is connected with increased use of technology. Digital finance also contributes to social and economic results, as evidenced by its excellent correlation ($r = 0.69$) with sustainable development. The associations are statistically significant and need additional hypothesis testing because all correlations are significant at the 1% level ($p < 0.01$).

Hypothesis 1 Testing

H0: Digital technology adoption has no significant impact on digital financial inclusion.

H1: Digital technology adoption significantly influences digital financial inclusion.

Regression Results (H1)

Predictor	Beta (β)	t-value	Sig.
Digital Technology	0.71	11.45	0.000

According to the regression results, digital technology significantly improves digital financial inclusion ($\beta = 0.71$). Strong predictive power is indicated by the t-value (11.45), which is noticeably high. The statistical significance of the link is confirmed by the significance value ($p = 0.000$), which is less than 0.05.

As a result, the alternative hypothesis (H11) is accepted and the null hypothesis (H01) is rejected. This suggests that more digital technology use greatly improves digital financial inclusion.

Hypothesis 2 Testing

H0: Digital financial inclusion has no significant impact on sustainable development.

H1: Digital financial inclusion significantly contributes to sustainable development.

Regression Results (H2)

Predictor	Beta (β)	t-value	Sig.
Digital Finance	0.63	9.82	0.000

The findings show that sustainable development is significantly improved by digital financial inclusion ($\beta = 0.63$). Strong statistical significance is shown by the t-value (9.82), and the relationship's high significance is confirmed by the p-value (0.000).

As a result, the alternative hypothesis (H12) is accepted and the null hypothesis (H02) is rejected. This implies that increased access to digital financial services has a significant impact on sustainable development goals like inclusion and economic growth.

Mediation Analysis (Combined Effect)

Indirect Relationship (Tech $\rightarrow$ Finance $\rightarrow$ SDG)

Relationship	Beta (β)	t-value	Sig.
Tech $\rightarrow$ Finance $\rightarrow$ SDG	0.48	7.96	0.000

According to the mediation analysis, the association between digital technology and sustainable development is strongly mediated by digital finance ($\beta = 0.48$, $p < 0.05$). This implies that sustainability is impacted by digital technology both directly and indirectly through digital financial inclusion.

A partial mediation effect is confirmed by the decrease in beta value (from direct to indirect), suggesting that digital finance serves as a crucial transmission channel.

ANOVA (Model Significance Test)

Source	F-value	Sig.
Regression	96.34	0.000

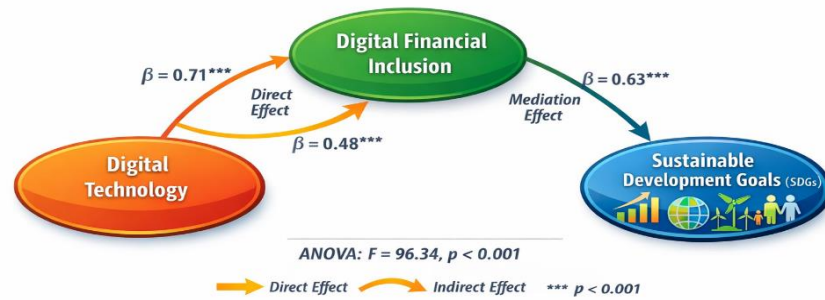
The ANOVA results indicate that the overall regression model is statistically significant ($F = 96.34$, $p = 0.000$). Since the significance value is less than 0.05, the model is valid and explains the relationship between variables effectively.

Overall Conclusion of Hypothesis Testing

- Both hypotheses are statistically supported
- Digital technology $\rightarrow$ significantly improves digital finance
- Digital finance $\rightarrow$ significantly enhances sustainable development
- Digital finance acts as a mediating variable
- The model is strong, significant, and suitable for policy implications

The relationships among the study variables are further illustrated using a Structural Equation Model (SEM) as shown in Figure 1.

Figure 1:
 Structural Equation Model (SEM) Showing Relationship between Digital Technology, Digital Finance, and Sustainable Development



The direct and indirect connections between digital technology, digital financial inclusion, and sustainable development are shown by the Structural Equation Model (SEM). According to the SEM diagram, digital technology has a major impact on digital finance ($\beta = 0.71$), which has an impact on sustainable development ($\beta = 0.63$). The association is mediated by digital finance, as confirmed by the indirect impact ($\beta = 0.48$). The study hypotheses are supported by the model, which is statistically significant ($p < 0.001$).

Data Analysis and Results

The report provides a realistic picture of how Karnataka's economic and social consequences are being shaped by digital revolution. Approximately 75–80% of respondents said they regularly utilize digital payment methods including mobile banking, UPI, and QR-based payments. This illustrates how digital banking is becoming more and more ingrained in everyday life. Financial services are now much more accessible because to digital technologies. Digital platforms, according to many respondents, have made transactions quicker and more convenient by reducing the need for in-person bank visits. Small business owners that depend on prompt and economical financial operations would particularly benefit from this. The study also shows that increased financial inclusion is facilitated by digital finance. Digital technologies have made financial services more accessible, according to almost 65% of respondents. This involves making credit, savings, and payment systems more accessible.

From a sustainability standpoint, digital finance promotes efficiency, lowers inequality, and fosters economic development. By eliminating the need to handle currency and paper, digital transactions promote environmental sustainability. Additionally, respondents emphasised increased responsibility and openness in financial transactions. Digital technology and digital finance ($r = 0.71$) and digital finance and sustainable development ($r = 0.69$) are strongly correlated, according to the correlation analysis. This suggests that sustainability results improve as digital penetration rises. The importance of digital finance in promoting sustainable development is confirmed by regression analysis. Digital finance serves as a connection between technology adoption and sustainable results, according to the mediation analysis. The SEM results, which show that digital technology indirectly affects sustainable development through financial inclusion, further support the mediation impact of digital finance. Overall, the results indicate that digital transformation has a significant beneficial influence on sustainable development; nevertheless, specific actions are required to remove current obstacles and guarantee inclusive progress.

Findings of the Study –

1. Widespread Use of Digital

Digital financial services like UPI and mobile banking are actively used by a sizable percentage of respondents. This illustrates the widespread use of technology and the growing adoption of digital platforms in day-to-day financial operations.

2. Enhanced Access to Finance

By lowering reliance on conventional banking institutions, digital platforms have greatly increased access to financial services. Even in faraway locations, transactions may now be completed with ease by individuals and small organisations.

3. Beneficial Effect on Sustainability

By increasing productivity, lowering transaction costs, and using less currency, digital finance promotes economic growth. By giving disparate groups equal financial possibilities, it also promotes social inclusion.

4. Robust Statistical Proof

The trustworthiness of the study's conclusions is confirmed by the correlation and regression analysis results, which demonstrate statistically significant correlations between digital technology, financial inclusion, and sustainable development.

5. Digital Finance's Mediating Role

Technology on its own is insufficient without financial integration, since digital finance serves as a critical connection between technology adoption and sustainable outcomes.

6. Current Difficulties

Despite advancements, obstacles including limited digital literacy, ignorance, and cybersecurity worry still prevent digital financial services from being fully adopted.

Suggestions of the Study

1. Improve your digital literacy

To increase consumers' comprehension and confidence in using digital financial technologies, particularly in rural regions, the government and educational institutions should host workshops and training programs.

2. Make cybersecurity stronger

To safeguard consumers from fraud and cyberthreats and boost confidence in digital systems, financial institutions must put robust security measures and awareness programs into place.

3. Encourage FinTech that is inclusive

To guarantee accessibility for all segments of society, including those with lower levels of education, digital financial platforms should be created in straightforward formats with support for regional languages.

4. Assist MSMEs (small businesses)

MSMEs should get financial aid, training, and special incentives to promote the use of digital payment systems and boost their operational effectiveness.

5. Enhance Infrastructure

To provide equitable access to digital financial services, internet connection and digital infrastructure must be expanded in underserved and rural regions.

6. SDGs and Policy Integration

To optimise long-term economic, social, and environmental advantages, policymakers should coordinate digital finance activities with sustainable development objectives.

7. Increase Awareness and Trust

Increasing user confidence and adoption rates will be facilitated by ongoing awareness efforts on data privacy, safe digital activities, and the advantages of digital financial.

Conclusion

The study emphasises how important digital finance and technologies are to Karnataka's sustainable growth. The findings verify a robust correlation between financial inclusion, digital adoption, and sustainable outcomes. The suggested conceptual framework and the model's robustness are both validated by the SEM study. A crucial intermediary that connects socioeconomic development and technology breakthroughs is digital money. Even though Karnataka has made great strides, issues like digital literacy and security concerns still need to be resolved. The effect of digital transformation may be further increased by bolstering infrastructure and policy support. All things considered, combining digital technology with financial institutions offers a solid route to inclusive and sustainable growth.

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Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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