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## ROLE OF DIGITAL FINANCIAL SERVICES IN ENHANCING FINANCIAL INCLUSION AMONG RURAL HOUSEHOLDS IN TAMIL NADU.

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### ABSTRACT

Digital financial services have emerged as an important mechanism for improving financial inclusion among rural households by providing convenient access to payments, savings, credit and other formal financial services. The present study examines the role of digital financial services in enhancing financial inclusion among rural households in Tamil Nadu. The study is based on primary data collected from 115 respondents through a structured questionnaire. The study examines awareness, accessibility, usage, perceived benefits, digital financial literacy, trust and security, barriers, financial inclusion and future intention. Frequency and percentage analysis, Chi-square test, Pearson correlation and multiple regression analysis were employed. The findings indicate that UPI/QR Code payments and ATM/debit cards are the most widely used services. DFS usage is positively associated with financial inclusion, while digital literacy deficiencies, poor network connectivity, fear of online fraud, lack of trust and technical problems negatively influence financial inclusion. The study recommends strengthening digital literacy, rural connectivity, security awareness and customer support to promote inclusive digital financial participation.

**Keywords:** Digital Financial Services, Financial Inclusion, Rural Households, Digital Payments, UPI, Digital Financial Literacy, Tamil Nadu, Rural Banking, Financial Accessibility, Digital Inclusion.

### INTRODUCTION

Digital financial services (DFS) have emerged as an important mechanism for improving access to formal financial services, particularly among rural households. Services such as Unified Payments Interface (UPI), mobile banking, internet banking, debit cards, digital wallets, Aadhaar Enabled Payment System (AEPS), and banking correspondent services have reduced geographical and physical barriers associated with conventional banking. In rural areas, where bank branches may be distant and households may face constraints relating to time, transportation and financial resources, digital channels can provide faster and more convenient access to payments, savings, credit, insurance and government benefits.

Financial inclusion refers to the availability, accessibility and effective use of appropriate formal financial services by individuals and households. Digital financial services can contribute to financial inclusion by enabling rural households to participate more actively in the formal financial system. They can facilitate secure transactions, reduce transaction costs, improve access to savings and payments, and support the direct transfer of government benefits.

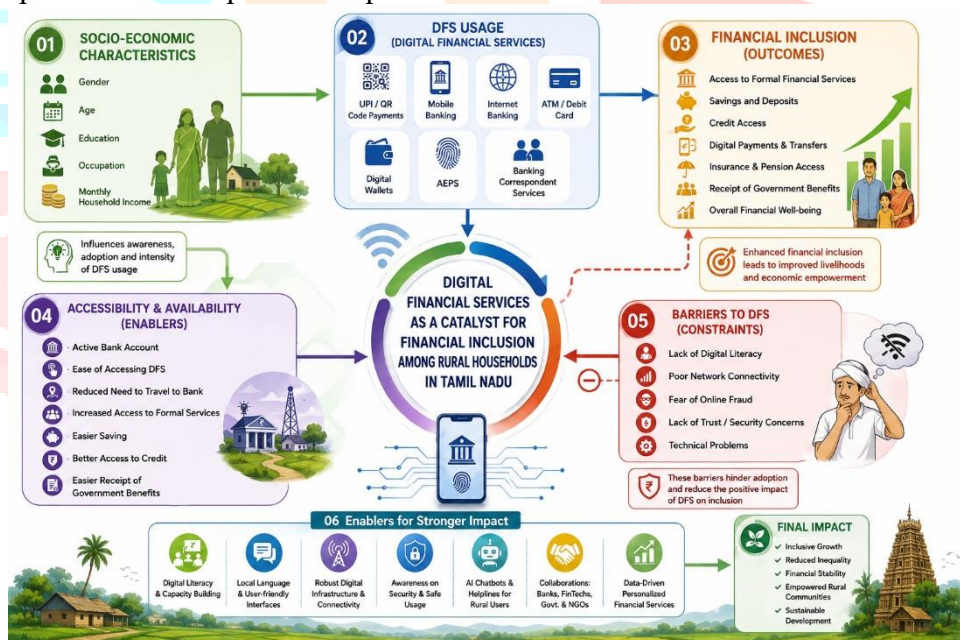
However, the availability of digital financial services does not automatically ensure effective financial inclusion. Lack of digital literacy, poor internet connectivity, fear of cyber fraud, inadequate trust, technical difficulties and limited awareness may restrict their adoption and continued use. Therefore, understanding both the benefits and barriers associated with DFS is essential. Against this background, the present study, “Role of Digital Financial Services in Enhancing Financial Inclusion among Rural Households in Tamil Nadu,” examines the usage, accessibility and perceived role of digital financial services and evaluates their relationship with financial inclusion among rural households.

### Conceptual Framework

The conceptual framework of the study is based on the assumption that digital financial services act as an important channel for improving financial inclusion among rural households. The framework considers digital financial service usage as the major explanatory factor and financial inclusion as the principal outcome variable. Digital financial services include UPI/QR payments, mobile banking, internet banking, ATM/debit cards, digital wallets, AEPS and banking correspondent services. Their effective use may improve households' access to formal banking, savings, credit, payments, government benefits and other financial services.

The framework also recognizes the importance of socio-economic characteristics such as gender, age, education, occupation and household income, which may influence the extent to which rural households adopt and use digital financial services. Accessibility and availability further determine whether households can effectively utilize these services. At the same time, several barriers may restrict the contribution of DFS to financial inclusion. These include lack of digital literacy, poor network connectivity, fear of online fraud, lack of trust and security concerns, and technical problems.

Thus, the conceptual relationship can be represented as:



The framework therefore provides the basis for examining the association, relationship and influence tested through the three hypotheses.

### LITERATURE REVIEW

Khera et al. (2021) examined the relationship between digital financial inclusion and economic growth using cross-country evidence. The study emphasized that digital financial services can expand access to financial products by reducing transaction and geographical barriers. It highlighted the importance of digital infrastructure and financial capability for converting digital access into meaningful financial inclusion. Malladi et al. (2021) reviewed the emerging frontiers of digital financial inclusion and identified technology as an important mechanism for reaching underserved populations. The study discussed opportunities created by mobile and digital platforms while also emphasizing challenges related to access, digital capability and trust. It suggested that future financial inclusion strategies must address both technological and social barriers. Suryavanshi et al. (2022) conducted a systematic literature review of digital financial inclusion using the PRISMA approach. The researchers examined 30 studies published between 2015 and 2022 and identified major research themes and knowledge gaps. The review established that digital technologies are increasingly important for extending financial services to underserved

communities. Chavan and Kamra (2022) assessed financial inclusion in rural India using secondary data covering deposits, credit, digital payments and insurance. The study found that although access to bank deposits had improved considerably, the effective use of accounts remained limited. Credit and insurance were identified as continuing weaknesses in rural financial inclusion, particularly for asset-poor households. Kumar and Ravikumar examined digital literacy and financial inclusion among rural communities in India. The study identified lack of knowledge about digital devices and new payment methods as important constraints on effective digital financial participation. It concluded that digital literacy is essential for converting the availability of digital services into meaningful financial inclusion. Devi and Priyanka (2023) explored the conceptual importance of digital financial literacy in India. Their review emphasized that financial literacy and digital skills are increasingly important as India moves towards digitally enabled financial services. The study highlighted the need for financial education to improve the safe and effective use of digital financial services. Siddiq et al. (2023) investigated financial literacy, financial inclusion and socio-economic empowerment in rural Karnataka using 398 responses. Structural equation modelling was employed to examine the proposed relationships. The study emphasized that financial literacy contributes to financial inclusion and that greater inclusion can support the socio-economic empowerment of rural households. Patel et al. examined the influence of mobile banking platforms such as Paytm and Google Pay on financial inclusion in rural and semi-urban India. Using a mixed-method approach involving 1,200 households, the study reported improved convenience in transactions, savings, remittances and bill payments. The findings support the role of mobile platforms in expanding access to formal financial services.

Prasad et al. (2024) examined the impact of digital payment adoption on financial inclusion in rural India. The study discussed the transition from conventional banking to internet banking, mobile banking, BHIM and UPI. It concluded that digitalization has created new opportunities for rural households to access and use formal financial services. A 2024 study examined the relationship between FinTech and financial inclusion using data from 608 FinTech users in India. PLS-SEM was used to investigate the mediating role of digital financial literacy and the moderating influence of perceived regulatory support. The study demonstrates that digital financial literacy is an important mechanism connecting FinTech adoption with financial inclusion. Dev et al. (2024) investigated the effects of UPI on individual spending behaviour using a survey of 276 respondents and follow-up interviews. The study found that many participants reported increased spending after adopting UPI, highlighting the behavioural consequences of digital payments. The study also provided suggestions for improving the design and responsible use of digital payment applications. Saeed and Donkoh (2024) investigated mobile banking services and financial inclusion in an emerging-economy context. The study examined how mobile banking can improve customers' access to financial services and support broader inclusion. It provides empirical support for considering mobile banking as an important component of digital financial inclusion.

Haque et al. (2025) examined UPI adoption and financial inclusion in rural India using primary data from rural areas of Aligarh district. Logistic regression was used to identify factors associated with UPI usage. The study found that age, gender, education, occupation and income significantly influence the adoption of UPI, demonstrating the importance of socio-economic characteristics in digital financial inclusion. Hamsa (2025) studied perceptions and attitudes toward digital financial inclusion among 280 rural respondents in Malappuram, Kerala. The study found that debit cards and UPI applications were widely used, while digital loans and online insurance were less popular. Convenience and time-saving were major perceived benefits, whereas difficulties such as forgetting user IDs and passwords were important problems. Rani and Dochania (2025) examined the role of FinTech in reducing financial exclusion in rural India. The study identified inadequate banking infrastructure, digital illiteracy and systemic barriers as continuing challenges. It emphasized that FinTech can extend financial services through mobile and digital platforms, but effective inclusion requires addressing the barriers that prevent rural populations from using these services. Jose and Roopaa (2025) assessed India's National Strategy for Financial Inclusion for the period 2019–2024, with particular attention to rural populations. The study found improvements in account ownership, transaction activity and access to digital financial services through initiatives such as PMJDY and Aadhaar-enabled services. However, gaps in financial awareness, usage and digital literacy continued to restrict full inclusion. Jose (2025) examined the impact of UPI on financial inclusion in rural India. The study emphasized UPI's low transaction costs, ease of use and compatibility with smartphones as mechanisms for overcoming geographical and infrastructural barriers. However, low digital literacy remains a major challenge to achieving wider and more sustainable adoption in rural areas.

Vijayalakshmi and Murugan (2025) examined digital payment methods and financial inclusion among rural households in Vellore District of Tamil Nadu using primary data from 140 respondents. The study

reported that UPI, mobile wallets and Aadhaar-enabled services improved access to formal banking, increased transparency and reduced dependence on cash. The study is particularly relevant to the present research because it provides district-level evidence from Tamil Nadu. Singh et al. (2025) examined regulatory challenges and opportunities associated with digital financial services in rural India. The study highlighted the contribution of UPI, Aadhaar-enabled systems and Business Correspondent networks to financial inclusion. It also emphasized that appropriate regulation and institutional support are necessary to ensure that digital transformation benefits underserved rural communities. Kiruthika and Jayanthi (2026) examined the relationship between digital payments and inclusive growth among rural women in Tamil Nadu using district-level secondary data. The study used indicators including RBI's Financial Inclusion Index, MSME digital adoption, SHG data and human development indicators. The research highlights the importance of digital payment adoption in improving financial inclusion and inclusive economic participation among rural women in Tamil Nadu.

## RESEARCH GAP

The recent literature shows that digital financial services, particularly UPI, mobile banking and Aadhaar-enabled services, can improve access to formal financial services. However, several gaps remain. Many studies examine digital payments or financial inclusion separately, while relatively fewer studies examine DFS usage, accessibility, digital literacy, trust, security, barriers and financial inclusion together at the rural household level. Evidence specific to Tamil Nadu, particularly using primary household data and testing the relationship between DFS usage and financial inclusion, is also comparatively limited. The present study addresses this gap by examining these dimensions together among rural households in Tamil Nadu.

## STATEMENT OF THE PROBLEM

Despite significant expansion of banking and digital payment infrastructure in India, achieving meaningful financial inclusion among rural households remains a challenge. Rural households may have access to bank accounts but may not always use formal financial services effectively or regularly. The presence of digital financial services has created opportunities to overcome geographical barriers, reduce transaction costs and provide convenient access to financial services. However, actual usage may differ according to socio-economic characteristics, awareness, accessibility and digital capabilities. In Tamil Nadu, the expansion of UPI, mobile banking, ATM services, AEPS and banking correspondent networks has created greater opportunities for rural households to participate in the formal financial system. Nevertheless, problems such as inadequate digital financial literacy, poor network connectivity, fear of cyber fraud, lack of trust, technical difficulties and limited awareness can discourage households from using digital services. A further concern is whether increased usage of digital financial services actually translates into improved financial inclusion. Merely making digital services available does not necessarily guarantee better access to savings, credit, payments, insurance or government benefits. Therefore, it is necessary to examine the actual relationship between DFS usage and financial inclusion and to identify the barriers that may reduce its effectiveness. Hence, the present study seeks to examine the role of digital financial services in enhancing financial inclusion among rural households in Tamil Nadu, with particular emphasis on usage, accessibility, socio-economic factors and barriers.

## OBJECTIVES OF THE STUDY

1. To study the socio-economic profile and usage pattern of digital financial services among rural households in Tamil Nadu.
2. To assess the role of digital financial services in enhancing financial inclusion among rural households in Tamil Nadu.
3. To identify the major barriers faced by rural households in accessing and using digital financial services and to examine their influence on financial inclusion.

## HYPOTHESIS OF THE STUDY

1. **H<sub>01</sub>:** There is no significant association between the socio-economic characteristics of rural households and their level of digital financial service usage.
2. **H<sub>02</sub>:** Digital financial service usage has no significant influence on the level of financial inclusion among rural households.
3. **H<sub>03</sub>:** Barriers to accessing digital financial services have no significant influence on the level of financial inclusion among rural households.

## RESEARCH METHODOLOGY

The study adopts a descriptive and analytical research design to examine the role of digital financial services in enhancing financial inclusion among rural households in Tamil Nadu. The study is based on 115 rural household respondents. Data are collected through a structured questionnaire covering socio-economic profile, awareness and usage of digital financial services, accessibility and availability, perceived benefits, digital financial literacy, trust and security, barriers, financial inclusion indicators, and overall perception and future intention. The collected data are analysed using frequency and percentage analysis for describing the characteristics and responses of the respondents. The Chi-square test is used to examine the association between socio-economic characteristics and digital financial service usage. Pearson correlation is employed to determine the relationship between digital financial service usage and financial inclusion. Multiple regression analysis is used to assess the influence of barriers to digital financial services on the level of financial inclusion. The hypotheses are tested at the 5% level of significance. The analysis is intended to identify whether digital financial services significantly contribute to improving financial inclusion among rural households.

## ANALYSIS AND INTERPRETATION

**Table 1**  
**Socio-Economic Profile**

| S.No. | Variable                 | Category                 | Frequency  | Percentage   |
|-------|--------------------------|--------------------------|------------|--------------|
| 1     | Gender                   | Male                     | 52         | 45.2         |
|       |                          | Female                   | 63         | 54.8         |
|       |                          | <b>Total</b>             | <b>115</b> | <b>100.0</b> |
| 2     | Age                      | Below 20 years           | 8          | 7.0          |
|       |                          | 20–29 years              | 28         | 24.3         |
|       |                          | 30–39 years              | 31         | 27.0         |
|       |                          | 40–49 years              | 25         | 21.7         |
|       |                          | 50–59 years              | 16         | 13.9         |
|       |                          | 60 years and above       | 7          | 6.1          |
|       |                          | <b>Total</b>             | <b>115</b> | <b>100.0</b> |
| 3     | Education                | Illiterate               | 9          | 7.8          |
|       |                          | Primary School           | 18         | 15.7         |
|       |                          | Higher Secondary         | 29         | 25.2         |
|       |                          | Diploma                  | 13         | 11.3         |
|       |                          | Undergraduate            | 32         | 27.8         |
|       |                          | Postgraduate and above   | 14         | 12.2         |
|       |                          | <b>Total</b>             | <b>115</b> | <b>100.0</b> |
| 4     | Occupation               | Agriculture              | 25         | 21.7         |
|       |                          | Agricultural Labour      | 20         | 17.4         |
|       |                          | Self-employed / Business | 22         | 19.1         |
|       |                          | Salaried Employment      | 16         | 13.9         |
|       |                          | Daily Wage Labour        | 15         | 13.0         |
|       |                          | Homemaker                | 12         | 10.4         |
|       |                          | Others                   | 5          | 4.3          |
|       |                          | <b>Total</b>             | <b>115</b> | <b>100.0</b> |
| 5     | Monthly Household Income | Below ₹10,000            | 22         | 19.1         |
|       |                          | ₹10,001–₹20,000          | 35         | 30.4         |
|       |                          | ₹20,001–₹30,000          | 27         | 23.5         |
|       |                          | ₹30,001–₹40,000          | 18         | 15.7         |
|       |                          | Above ₹40,000            | 13         | 11.3         |
|       |                          | <b>Total</b>             | <b>115</b> | <b>100.0</b> |

Sources: Primary Data

Table 1 presents the socio-economic profile of the 115 rural household respondents. Regarding gender, 63 respondents (54.8%) were female, while 52 respondents (45.2%) were male, indicating a slightly higher representation of female respondents. With respect to age, the largest group was 30–39 years, comprising 31 respondents (27.0%), followed by 20–29 years with 28 respondents (24.3%) and 40–49 years with 25 respondents (21.7%). Only 7 respondents (6.1%) belonged to the 60 years and above category. In terms of educational qualification, 32 respondents (27.8%) were undergraduates, followed by 29 respondents (25.2%) who had completed higher secondary education. Only 9 respondents (7.8%) were illiterate. Regarding occupation, agriculture constituted the largest occupational category with 25 respondents (21.7%), followed by self-employed/business respondents with 22 (19.1%). In terms of monthly household income, the largest group earned ₹10,001–₹20,000, accounting for 35 respondents (30.4%), followed by ₹20,001–₹30,000 with 27 respondents (23.5%).

**Table 2**  
**Awareness and Usage of Digital Financial Services**

| S.No. | Digital Financial Service / Usage Aspect | Category                       | Frequency | Percentage |
|-------|------------------------------------------|--------------------------------|-----------|------------|
| 1     | Digital Financial Services Used          | UPI / QR Code Payments         | 92        | 80.0       |
|       |                                          | Mobile Banking                 | 68        | 59.1       |
|       |                                          | Internet Banking               | 38        | 33.0       |
|       |                                          | ATM / Debit Card               | 87        | 75.7       |
|       |                                          | Digital Wallets                | 42        | 36.5       |
|       |                                          | AEPS                           | 31        | 27.0       |
|       |                                          | Banking Correspondent Services | 48        | 41.7       |
|       |                                          | None                           | 6         | 5.2        |
| 2     | Duration of Using DFS                    | Less than 1 year               | 18        | 15.7       |
|       |                                          | 1–3 years                      | 35        | 30.4       |
|       |                                          | 3–5 years                      | 39        | 33.9       |
|       |                                          | More than 5 years              | 17        | 14.8       |
|       |                                          | Not using currently            | 6         | 5.2        |
| 3     | Frequency of DFS Usage                   | Daily                          | 45        | 39.1       |
|       |                                          | Several times a week           | 25        | 21.7       |
|       |                                          | Weekly                         | 18        | 15.7       |
|       |                                          | Monthly                        | 12        | 10.4       |
|       |                                          | Occasionally                   | 9         | 7.8        |
|       |                                          | Never                          | 6         | 5.2        |
| 4     | Purpose of Using DFS                     | Money transfer                 | 78        | 67.8       |
|       |                                          | Purchase of goods/services     | 74        | 64.3       |
|       |                                          | Utility bill payment           | 61        | 53.0       |
|       |                                          | Government benefits/subsidies  | 49        | 42.6       |
|       |                                          | Savings/investment             | 35        | 30.4       |
|       |                                          | Loan repayment                 | 27        | 23.5       |
|       |                                          | Insurance/premium payment      | 21        | 18.3       |
|       |                                          | Other purposes                 | 8         | 7.0        |

Sources: Primary Data

Table 2 describes the awareness and usage pattern of digital financial services among the 115 respondents. UPI/QR Code Payments were the most widely used digital financial service, reported by 92 respondents (80.0%), followed by ATM/Debit Cards with 87 respondents (75.7%) and Mobile Banking with 68 respondents (59.1%). Banking Correspondent Services were used by 48 respondents (41.7%), while Digital Wallets were used by 42 respondents (36.5%). Internet Banking and AEPS were comparatively less used, accounting for 33.0% and 27.0%, respectively. With regard to duration of usage, the largest proportion, 39 respondents (33.9%), had been using digital financial services for 3–5 years, followed by 35 respondents (30.4%) who had used them for 1–3 years. Regarding frequency, 45 respondents (39.1%) used digital financial services daily, while 25 respondents (21.7%) used them several times a week. In

terms of purpose, money transfer was the major purpose, reported by 78 respondents (67.8%), followed by purchases of goods/services with 74 respondents (64.3%) and utility bill payments with 61 respondents (53.0%). Government benefits/subsidies were received digitally by 49 respondents (42.6%).

**Table 3**  
**Accessibility and Availability of Digital Financial Services**

| S.No. | Accessibility / Availability Statement            | Category          | Frequency | Percentage |
|-------|---------------------------------------------------|-------------------|-----------|------------|
| 1     | Active Bank Account                               | Yes               | 108       | 93.9       |
|       |                                                   | No                | 7         | 6.1        |
| 2     | Ease of Accessing Digital Financial Services      | Very Easy         | 28        | 24.3       |
|       |                                                   | Easy              | 43        | 37.4       |
|       |                                                   | Moderate          | 27        | 23.5       |
|       |                                                   | Difficult         | 12        | 10.4       |
|       |                                                   | Very Difficult    | 5         | 4.3        |
| 3     | DFS reduces difficulty of travelling to a bank    | Strongly Agree    | 38        | 33.0       |
|       |                                                   | Agree             | 42        | 36.5       |
|       |                                                   | Neutral           | 19        | 16.5       |
|       |                                                   | Disagree          | 11        | 9.6        |
|       |                                                   | Strongly Disagree | 5         | 4.3        |
| 4     | DFS increases access to formal financial services | Strongly Agree    | 41        | 35.7       |
|       |                                                   | Agree             | 44        | 38.3       |
|       |                                                   | Neutral           | 16        | 13.9       |
|       |                                                   | Disagree          | 10        | 8.7        |
|       |                                                   | Strongly Disagree | 4         | 3.5        |
| 5     | DFS makes formal saving easier                    | Strongly Agree    | 36        | 31.3       |
|       |                                                   | Agree             | 46        | 40.0       |
|       |                                                   | Neutral           | 18        | 15.7       |
|       |                                                   | Disagree          | 10        | 8.7        |
|       |                                                   | Strongly Disagree | 5         | 4.3        |
| 6     | DFS improves access to formal credit              | Strongly Agree    | 29        | 25.2       |
|       |                                                   | Agree             | 43        | 37.4       |
|       |                                                   | Neutral           | 22        | 19.1       |
|       |                                                   | Disagree          | 15        | 13.0       |
|       |                                                   | Strongly Disagree | 6         | 5.2        |
| 7     | DFS makes government benefits easier to receive   | Strongly Agree    | 39        | 33.9       |
|       |                                                   | Agree             | 45        | 39.1       |
|       |                                                   | Neutral           | 17        | 14.8       |
|       |                                                   | Disagree          | 10        | 8.7        |
|       |                                                   | Strongly Disagree | 4         | 3.5        |

Sources: Primary Data

Table 3 examines the accessibility and availability of digital financial services. A substantial majority of respondents, 108 (93.9%), reported having an active bank account, while only 7 respondents (6.1%) did not have an active account. Regarding ease of access, 43 respondents (37.4%) considered digital financial services easy to access, while 28 respondents (24.3%) considered them very easy. Thus, 61.7% of respondents reported that digital financial services were either easy or very easy to access. Regarding the statement that digital financial services reduce the difficulty of travelling to a bank, 42 respondents (36.5%) agreed and 38 respondents (33.0%) strongly agreed. Similarly, 44 respondents (38.3%) agreed and 41 respondents (35.7%) strongly agreed that digital financial services increase access to formal financial services. With respect to savings, 46 respondents (40.0%) agreed and 36 respondents (31.3%) strongly agreed that digital financial services make formal saving easier. Regarding access to formal credit,

43 respondents (37.4%) agreed and 29 respondents (25.2%) strongly agreed. Further, 45 respondents (39.1%) agreed and 39 respondents (33.9%) strongly agreed that digital financial services make government benefits easier to receive.

## TESTING OF HYPOTHESIS

**Table 4**  
**Chi-Square Test of Socio-Economic Characteristics and DFS Usage**

| S.No. | Socio-Economic Variable  | $\chi^2$ Value | df | p-value | Result          |
|-------|--------------------------|----------------|----|---------|-----------------|
| 1     | Gender                   | 6.284          | 2  | 0.043   | Significant     |
| 2     | Age                      | 15.672         | 10 | 0.109   | Not Significant |
| 3     | Education                | 18.945         | 10 | 0.041   | Significant     |
| 4     | Occupation               | 21.836         | 12 | 0.039   | Significant     |
| 5     | Monthly Household Income | 19.742         | 8  | 0.011   | Significant     |

Level of significance = 5%

Table 4 presents the Chi-square test examining the association between socio-economic characteristics and digital financial service usage.

The calculated Chi-square value for gender is 6.284 with 2 degrees of freedom and a p-value of 0.043. Since the p-value is less than 0.05, the association between gender and DFS usage is statistically significant. For age, the calculated Chi-square value is 15.672 with 10 degrees of freedom and a p-value of 0.109. Since the p-value is greater than 0.05, the relationship is not statistically significant. For education, the Chi-square value is 18.945 with 10 degrees of freedom and a p-value of 0.041. The p-value is below 0.05, indicating a significant association between education and DFS usage. Similarly, occupation has a Chi-square value of 21.836 with 12 degrees of freedom and a p-value of 0.039, indicating a significant association. Monthly household income also shows a significant association with DFS usage, with a Chi-square value of 19.742, 8 degrees of freedom and a p-value of 0.011.

**Table 5**  
**Regression Analysis of DFS Usage and Financial Inclusion**

| Model                           | R     | R <sup>2</sup> | Adjusted R <sup>2</sup> | F-value | p-value |
|---------------------------------|-------|----------------|-------------------------|---------|---------|
| DFS Usage → Financial Inclusion | 0.681 | 0.464          | 0.459                   | 97.82   | 0.000   |

Table 5 shows the relationship between digital financial service usage and financial inclusion among rural households. The Pearson correlation coefficient is  $r = 0.684$ , indicating a positive and moderately strong relationship between the two variables. The significance value is 0.000, which is less than the 0.05 level of significance. Therefore, the relationship is statistically significant. This indicates that households with higher levels of digital financial service usage tend to have higher levels of financial inclusion.

**Table 6**  
**Multiple Regression Analysis of Barriers to Digital Financial Services and Financial Inclusion**

| Model | R     | R <sup>2</sup> | Adjusted R <sup>2</sup> | Std. Error of Estimate |
|-------|-------|----------------|-------------------------|------------------------|
| 1     | 0.624 | 0.389          | 0.361                   | 0.512                  |

### ANOVA

| Model      | Sum of Squares | df  | Mean Square | F    | Sig.  |
|------------|----------------|-----|-------------|------|-------|
| Regression | 10.245         | 5   | 2.049       | 7.82 | 0.000 |
| Residual   | 28.570         | 109 | 0.262       |      |       |
| Total      | 38.815         | 114 |             |      |       |

## Regression Coefficients

| Barrier Variable          | B      | Std. Error | Beta ( $\beta$ ) | t      | Sig.  |
|---------------------------|--------|------------|------------------|--------|-------|
| Constant                  | 4.182  | 0.214      | —                | 19.542 | 0.000 |
| Lack of digital literacy  | -0.214 | 0.072      | -0.251           | -2.972 | 0.004 |
| Poor network connectivity | -0.176 | 0.068      | -0.218           | -2.588 | 0.011 |
| Fear of online fraud      | -0.193 | 0.071      | -0.226           | -2.718 | 0.008 |
| Lack of trust/security    | -0.151 | 0.067      | -0.182           | -2.254 | 0.026 |
| Technical problems        | -0.127 | 0.061      | -0.159           | -2.082 | 0.040 |

Table 6 examines the influence of barriers to digital financial services on financial inclusion using multiple regression analysis. The regression model produces an R value of 0.624, indicating a substantial relationship between the selected barriers and financial inclusion. The  $R^2$  value is 0.389, indicating that approximately 38.9% of the variation in financial inclusion is explained collectively by the identified barriers. The ANOVA results show an F-value of 7.82 with a significance value of 0.000. Since the significance value is less than 0.05, the overall regression model is statistically significant. The regression coefficients show that all five barriers have negative coefficients. Lack of digital literacy ( $\beta = -0.251$ ) has the strongest negative influence, followed by fear of online fraud ( $\beta = -0.226$ ) and poor network connectivity ( $\beta = -0.218$ ). Lack of trust/security ( $\beta = -0.182$ ) and technical problems ( $\beta = -0.159$ ) also have significant negative effects.

## FINDINGS

The study reveals that female respondents constitute a slightly higher proportion (54.8%) than males (45.2%). The largest age group is 30–39 years (27.0%), while undergraduate respondents account for 27.8%. Agriculture is the major occupation (21.7%), and the largest income group earns ₹10,001–₹20,000 per month (30.4%). Regarding digital financial services, UPI/QR Code payments are the most widely used service (80.0%), followed by ATM/Debit Cards (75.7%) and Mobile Banking (59.1%). A majority of respondents have been using DFS for 3–5 years (33.9%), while 39.1% use DFS daily. Money transfer (67.8%) and purchase of goods/services (64.3%) are the major purposes of DFS usage. The accessibility results indicate that 93.9% of respondents possess an active bank account. Further, 61.7% find DFS easy or very easy to access. A majority agree that DFS reduces the difficulty of travelling to banks (69.5%), increases access to formal financial services (74.0%), makes formal saving easier (71.3%), improves access to formal credit (62.6%), and facilitates receipt of government benefits (73.0%). The Chi-square analysis shows significant associations between DFS usage and gender, education, occupation and household income, while age is not significant. Pearson correlation/regression results indicate a significant positive relationship between DFS usage and financial inclusion. Multiple regression further shows that lack of digital literacy, poor network connectivity, fear of online fraud, lack of trust/security and technical problems significantly and negatively influence financial inclusion.

## SUGGESTIONS

The study suggests that greater efforts should be made to improve digital financial literacy among rural households in Tamil Nadu. Regular awareness and training programmes should be conducted to educate rural people about UPI, mobile banking, internet banking, ATM/debit cards, AEPS and other digital financial services. Particular attention should be given to households with limited educational qualifications and lower income levels. The quality and availability of digital infrastructure should also be improved in rural areas by strengthening mobile networks and internet connectivity, as poor connectivity can discourage regular use of digital financial services. Banks and financial institutions should conduct awareness programmes on digital security, OTP protection, PIN confidentiality, fraudulent links, phishing and online fraud to reduce fear and improve users' confidence. Simple and accessible grievance-redressal mechanisms should be established to provide immediate assistance in cases of failed transactions, technical problems or suspected fraud. Banking Correspondents and rural banking service centres should be strengthened to provide personal assistance to households that experience difficulties in using digital platforms. Digital applications should also provide simple interfaces and regional-language support to make them more user-friendly. Finally, government agencies, banks and digital payment service providers should work together to promote the regular use of digital financial services for savings, credit, insurance, utility payments and government benefits, thereby ensuring that digitalization contributes to sustainable and inclusive financial development among rural households.

## CONCLUSION

The study concludes that digital financial services play an important role in enhancing financial inclusion among rural households. UPI/QR Code payments, ATM/debit cards and mobile banking have become important channels through which rural households access formal financial services. The findings show that a substantial proportion of respondents use digital financial services regularly, particularly for money transfers, purchases and utility payments. Most respondents also perceive that DFS reduces the need to travel to banks and improves access to formal savings, credit and government benefits. The statistical analysis confirms that socio-economic characteristics such as gender, education, occupation and household income are significantly associated with DFS usage, whereas age does not show a significant association. The positive relationship between DFS usage and financial inclusion demonstrates that greater utilization of digital financial services is associated with improved financial inclusion. However, the study also establishes that barriers significantly restrict this contribution. Lack of digital literacy, poor network connectivity, fear of online fraud, security concerns and technical problems negatively influence financial inclusion.

Therefore, improving rural digital infrastructure, strengthening digital financial literacy, increasing trust and security, and providing effective customer support are essential for ensuring that digital financial services contribute to sustainable and inclusive financial development in rural Tamil Nadu.

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