



Digital Ecosystem of QR and Mobile Banking in Nepal's Cooperative Sector

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Article Info

ISSN (online): 2583-6641

Impact Factor (RSIF): 8.56

Volume: 05

Issue: 03

May-June 2026

Received: 23-03-2026

Accepted: 25-04-2026

Published: 27-05-2026

Page No: 141-145

Abstract

The rapid expansion of digital financial services has transformed modern banking systems across both developed and emerging economies. In Nepal, cooperative financial institutions play a vital role in promoting financial inclusion, particularly among rural and semi-urban populations. Despite their importance, the adoption of digital banking technologies within the cooperative sector remains uneven and under-researched. This study investigates the digital ecosystem surrounding QR payments and mobile banking services in Nepal's cooperative banking sector, focusing on the National Cooperative Bank Limited (NCBL) and its member cooperatives. A mixed-methods research design was employed, combining quantitative survey data collected from cooperative members and staff with qualitative insights from institutional interviews. Statistical analysis was conducted using SPSS to identify patterns of digital service adoption, usage frequency, and perceived operational benefits. The findings reveal that QR payments (60.7%) and member portal systems (60.0%) represent the most widely adopted digital services, while more advanced functionalities such as digital loan repayment remain minimally utilized. The results suggest that while foundational digital infrastructure exists, institutional, technological, and behavioral barriers continue to limit deeper digital integration. This paper proposes a cooperative-centric digital ecosystem framework emphasizing mobile-first design, interoperable payment platforms, and scalable infrastructure. The study contributes to understanding digital transformation within cooperative banking systems and provides recommendations for policymakers and financial institutions seeking to strengthen Nepal's digital financial ecosystem.

Keywords: Digital payments, Mobile Banking, QR Payment Systems, Cooperative Banking, Financial Inclusion, Digital Ecosystem, Nepal

Introduction

Digital transformation has become a defining characteristic of modern financial systems. Financial institutions worldwide increasingly rely on digital technologies such as mobile banking platforms, electronic payment networks, and online financial services to enhance operational efficiency and expand access to financial services. These technologies have significantly reduced transaction costs, improved transparency in financial operations, and enabled financial institutions to serve geographically dispersed populations more effectively.

In developing economies, digital financial services play a particularly important role in promoting financial inclusion. Mobile banking platforms and digital payment systems allow individuals to conduct financial transactions without requiring physical access to bank branches. Global studies on financial inclusion indicate that digital financial services can significantly improve access to banking services among low-income and underserved populations by reducing geographic and infrastructural barriers [1].

Nepal has experienced rapid growth in digital financial technologies over the past decade. Regulatory initiatives introduced by Nepal Rastra Bank have encouraged the development of electronic payment systems, mobile banking platforms, and digital wallet infrastructures across the country ^[2]. As a result, digital transaction volumes have increased significantly, particularly through QR-based payment systems and mobile banking applications.

While commercial banks have widely adopted digital banking technologies, the cooperative banking sector has experienced comparatively slower digital transformation. Cooperative financial institutions operate on community-based governance structures and primarily serve rural and semi-urban populations. These institutions play a critical role in supporting financial inclusion, savings, mobilization, and local economic development.

However, many cooperative institutions face challenges when implementing digital banking systems. These challenges include limited technological infrastructure, financial constraints, and lower levels of digital literacy among cooperative members. Consequently, the adoption of advanced digital financial technologies within cooperative institutions remains uneven.

The National Cooperative Bank Limited (NCBL) has introduced several digital financial services to strengthen the digital capabilities of cooperative institutions. These services include QR payment platforms, SMS-based alerts, member portal systems, and digital transaction reporting tools. Understanding how these technologies operate within a broader digital ecosystem is essential for evaluating their effectiveness and long-term impact on cooperative banking operations.

This study therefore investigates the adoption patterns, operational benefits, and institutional challenges associated with digital banking technologies within Nepal's cooperative banking sector.

Contributions of the Study

This study provides several contributions to research on digital banking and financial technology:

1. It analyzes the digital payment ecosystem of Nepal's cooperative banking sector.
2. It evaluates the adoption patterns of QR payments and mobile banking technologies among cooperative institutions.
3. It identifies institutional and technological barriers affecting digital service integration.
4. It proposes a digital ecosystem framework for scalable cooperative banking transformation.

Background of Digital Banking in Nepal

Over the past decade, the banking industry in Nepal has experienced significant digital transformation driven by technological advancement, regulatory initiatives, and increasing smartphone penetration. Financial institutions have gradually shifted from traditional branch-based banking systems toward digital platforms that enable customers to conduct transactions remotely through mobile devices and internet-based services.

Digital financial services, including mobile banking applications, QR-based payment systems, and electronic fund transfer platforms, have become essential components of modern banking infrastructure. These technologies allow customers to perform financial transactions such as balance

inquiries, fund transfers, bill payments, and merchant payments without visiting physical bank branches.

Nepal Rastra Bank (NRB), the central regulatory authority of Nepal's financial system, has played a crucial role in promoting digital banking initiatives. NRB introduced several regulatory frameworks designed to strengthen the national payment ecosystem, including guidelines for electronic payment systems, mobile banking services, and digital wallet platforms. These initiatives have significantly accelerated the development of digital payment infrastructure across the country.

The introduction of interoperable QR payment systems has further expanded digital financial transactions. QR payments allow users to scan merchant QR codes through mobile banking applications and complete transactions instantly. Compared to traditional card-based payment systems, QR payments require minimal infrastructure investment and are therefore more accessible for small businesses and rural financial institutions.

As a result, digital payment adoption in Nepal has increased rapidly in recent years. According to the Nepal Rastra Bank Payment System Oversight Report, digital transaction volumes have grown significantly, particularly through mobile banking and QR payment platforms. This growth reflects broader global trends in digital finance where mobile technology plays a central role in financial inclusion.

Despite these advancements, the cooperative banking sector has adopted digital technologies more slowly compared to commercial banks. Cooperative institutions often face limitations in technological infrastructure, financial resources, and technical expertise, which can hinder the implementation of advanced digital banking systems.

Understanding the role of digital financial technologies within cooperative banking institutions is therefore essential for evaluating the broader digital transformation of Nepal's financial system.

Related work

Digital Financial Services and Financial Inclusion

Digital financial services have become an important mechanism for expanding financial inclusion across developing economies. Technologies such as mobile banking, digital wallets, and electronic payment systems allow individuals to access financial services without relying on traditional banking infrastructure. Research based on the Global Findex Database shows that digital financial services significantly increase access to banking services among previously unbanked populations ^[1].

Digital finance also enhances efficiency within financial institutions. By automating transaction processing and financial record management, digital banking systems reduce operational costs and improve transparency. Studies suggest that digital finance can play a critical role in promoting inclusive economic growth by enabling broader participation in formal financial systems ^[3].

Technology Adoption in Digital Banking

The adoption of digital banking technologies has been widely examined through technology acceptance frameworks. The Technology Acceptance Model (TAM) suggests that perceived usefulness and perceived ease of use strongly influence whether users adopt new technologies ^[4].

The Unified Theory of Acceptance and Use of Technology (UTAUT) further extend this model by incorporating

additional determinants such as social influence and facilitating conditions. These factors are particularly relevant in institutional environments where organizational culture and infrastructure influence technology adoption behavior [5].

Empirical studies indicate that trust, technological literacy, and system reliability significantly affect digital banking adoption. In many developing economies, digital literacy remains a key determinant of whether users adopt mobile banking technologies.

QR Payment Systems

QR (Quick Response) payment systems have emerged as one of the most widely adopted digital payment technologies in developing economies. QR payments allow users to complete financial transactions by scanning merchant codes using mobile banking applications.

Compared to card-based payment systems, QR payments require minimal technological infrastructure and lower implementation costs. Merchants only require a printed QR code while users need smartphones with banking applications. Due to their simplicity and affordability, QR payment systems have been widely adopted in emerging financial markets as an accessible alternative to traditional payment infrastructure [6].

Digital Banking in Nepal's Cooperative Sector

Nepal's cooperative sector plays a significant role in the national financial ecosystem by providing financial services to millions of members across rural and community-based economic environments. Cooperative financial institutions contribute to savings mobilization, microfinance, and local economic development.

Despite their importance, cooperative institutions often face challenges in adopting advanced financial technologies due to limited technological infrastructure and financial resources. Previous research on digital banking adoption in Nepal has largely focused on commercial banking institutions, leaving the cooperative banking sector relatively under-explored.

This study therefore addresses an important research gap by examining digital payment adoption within the cooperative banking ecosystem, specifically focusing on the role of NCBL and its member cooperatives.

Research Methodology

This study adopts a mixed-methods research approach combining quantitative survey analysis with qualitative institutional insights. The mixed-methods design enables the study to examine both measurable adoption patterns and contextual factors influencing digital technology implementation.

Data Collection

Primary data were collected using structured questionnaires distributed to cooperative members and banking staff associated with the National Cooperative Bank Limited.

The survey captured information regarding:

1. Digital banking usage
2. Frequency of digital transactions
3. Perceived benefits of digital services
4. Barriers to digital adoption`

Qualitative data were also collected through semi-structured interviews with cooperative managers, banking staff, and technical personnel to gain deeper insights into institutional experiences with digital banking technologies.

Sample

The study included responses from:

140 member cooperatives

60 bank staff members

These participants represent both operational users and institutional decision-makers within the cooperative banking ecosystem.

Data Analysis

Quantitative data were analyzed using SPSS statistical software. The analysis included descriptive statistics and frequency analysis to identify patterns of digital service adoption.

Qualitative interview responses were analyzed using thematic analysis to identify common challenges and institutional perspectives.

Results and Analysis

Benefits of Digital Banking in Cooperative Institutions

The adoption of digital financial services offers several operational and strategic benefits for cooperative financial institutions.

First, digital banking systems significantly improve operational efficiency. Automated transaction processing reduces the time required to complete financial operations and minimizes manual administrative tasks. Digital transaction records also enhance data accuracy and reduce the risk of human error.

Second, digital banking platforms improve financial transparency and governance. Cooperative institutions rely on transparent financial management to maintain trust among members. Digital systems provide automated transaction logs and financial reporting tools that allow administrators to monitor financial activities more effectively.

Third, digital payment technologies support financial inclusion by expanding access to banking services for cooperative members who may live far from physical bank branches. Mobile banking applications allow members to access financial services using smartphones without requiring frequent visits to cooperative offices.

Fourth, digital financial services enable cooperative institutions to offer new financial products and services such as online loan applications, digital savings accounts, and automated payment systems. These services improve the competitiveness of cooperative institutions within the broader financial market.

Adoption of Digital Banking Services

The analysis revealed significant variation in the adoption of digital financial services among cooperative institutions. Digital Services and Adoption Rate

Digital Service	Adoption Rate
QR Payment	60.7%
Member Portal	60.0%
SMS Alerts	52.9%
ATM Services	6.4%
Digital Loan Repayment	2.1%

Digital Services and Adoption Rates in Cooperatives

The results indicate that QR payments and member portal or internet banking services have achieved the highest adoption levels. These technologies require relatively minimal infrastructure investment and are easy for cooperative members to use.

In contrast, services involving complex financial processes, such as digital loan management systems, remain rarely implemented.

Usage Frequency of Digital Services

Digital service usage varies considerably across cooperatives.

1. 58.8% of respondents reported daily digital service usage
2. 13.4% reported monthly usage
3. 15.1% rarely used digital banking services

This suggests that although digital systems are available, many cooperative institutions have not yet integrated them fully into daily operations.

Operational Benefits

Survey results indicate that digital systems significantly improve operational efficiency.

Staff respondents reported improved transaction processing speed and increased transparency in financial reporting. Automated transaction records and digital reporting systems enable more efficient monitoring and auditing processes.

Digital Banking Challenges in Cooperative Institutions

Although digital banking technologies provide significant benefits, cooperative financial institutions often face several challenges when implementing digital financial systems.

One of the primary challenges is limited technological infrastructure. Many cooperatives operate in rural areas where internet connectivity may be unreliable or slow. Stable internet connections are essential for operating mobile banking platforms and digital payment systems.

Another challenge is limited financial resources. Implementing digital banking infrastructure requires investments in software systems, servers, cybersecurity measures, and staff training. Smaller cooperatives may struggle to allocate sufficient financial resources for these investments.

Digital literacy also affects the adoption of mobile banking technologies. Many cooperative members may have limited experience using digital applications or smartphones for financial transactions. As a result, even when digital services are available, some members continue to rely on traditional banking methods.

Cybersecurity risks represent another important concern. Digital banking platforms must protect sensitive financial data from unauthorized access and cyber-attacks. Cooperative institutions must therefore implement strong authentication systems and data protection measures.

Addressing these challenges requires collaboration between cooperative institutions, financial technology providers, and regulatory authorities.

Discussion

The findings of this study indicate that the cooperative banking sector in Nepal has begun to adopt digital financial technologies, but the pace of adoption varies significantly across different services.

QR payment systems and member portal platforms have

achieved moderate levels of adoption because they require relatively minimal infrastructure investment and are easy for users to operate. These services represent the first stage of digital transformation within cooperative institutions.

However, advanced financial services such as digital loan processing and ATM integration remain limited. These services require more sophisticated technological infrastructure and higher levels of institutional investment.

The results also highlight the importance of digital literacy influencing digital banking adoption. Even when digital systems are available, some cooperative members may hesitate to use them due to lack of familiarity with digital financial technologies.

Policy initiatives by Nepal Rastra Bank and other regulatory institutions can play a critical role in accelerating digital transformation within the cooperative sector. Regulatory frameworks that promote interoperable payment systems, standardized banking platforms, and financial technology partnerships can help cooperatives overcome technological barriers.

Conclusion

This study examined the adoption and digital ecosystem of QR payment systems and mobile banking platforms within Nepal's cooperative banking sector. The findings demonstrate that digital financial technologies are gradually transforming cooperative banking operations, although significant challenges remain.

QR payment platforms and member portal or internet banking systems represent the most widely adopted digital services among cooperative institutions. These technologies have improved transaction efficiency and expanded access to financial services for cooperative members.

However, advanced digital banking services remain underdeveloped due to limitations in technological infrastructure, financial resources, and digital literacy.

To strengthen digital transformation within the cooperative sector, financial institutions should invest in scalable technological infrastructure, user-friendly mobile banking platforms, and digital literacy programs for cooperative members.

With appropriate policy support and technological investment, digital financial services have the potential to significantly improve the efficiency, transparency, and accessibility of cooperative banking systems in Nepal.

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How to Cite This Article

Rimal S, Thapaliya S. Digital ecosystem of QR and mobile banking in Nepal's cooperative sector. *International Journal of Management and Organizational Research.* 2026;5(3):141–145.

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