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Evaluating Scalability of QR and Mobile Banking in the Cooperative Bank of Nepal

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Abstract
Digital financial technologies have transformed the global banking landscape by enabling faster transactions, improved accessibility, and enhanced financial inclusion. In emerging economies such as Nepal, mobile banking platforms and Quick Response (QR) code-based payment systems have become essential tools for expanding digital financial services. Nepal Rastra Bank has actively promoted digital payment adoption through national payment infrastructure initiatives, including interoperable QR systems and mobile banking integration. Despite these developments, the scalability of digital banking services within Nepal's cooperative banking sector remains limited due to infrastructural, technological, and organizational constraints. Cooperative financial institutions play a vital role in Nepal's financial system by serving rural and semi-urban populations; however, many cooperatives lack the technological capacity required to implement large-scale digital banking systems. This study evaluates the scalability of QR payment systems and existing internet banking portals within the Cooperative Bank of Nepal, while assessing the readiness and institutional gaps for future mobile banking integration. The research adopts a mixed-method approach combining quantitative survey analysis with qualitative institutional assessment. Statistical analysis of digital service usage patterns indicates that QR payment systems and mobile banking services have gained moderate adoption, while advanced digital services such as automated loan repayments and ATM integrations remain limited. The study identifies key barriers affecting scalability, including digital literacy gaps, infrastructure limitations, and system interoperability challenges. The findings suggest that scalable digital banking architecture, cloud-based infrastructure, and stronger regulatory coordination are essential to support sustainable digital transformation within Nepal's cooperative banking sector.

Keywords: Mobile banking, QR payments, cooperative banking, digital finance, financial inclusion, scalability, Nepal

Introduction

Digital transformation has significantly reshaped the global financial industry. Financial institutions increasingly rely on digital technologies such as mobile banking platforms, electronic payment systems, and digital financial services to improve operational efficiency and customer convenience. Mobile banking enables customers to access financial services through smartphones, reducing dependence on physical bank branches, and improving accessibility to financial services [1].

In developing economies, digital financial technologies play a vital role in improving financial inclusion. Many populations in rural and remote regions lack access to traditional banking infrastructure due to geographic and economic barriers. Digital banking platforms provide an alternative solution by enabling financial transactions through mobile devices and internet connectivity [2].

Nepal has experienced rapid growth in digital financial services over the past decade. The expansion of smartphone usage, internet connectivity, and regulatory initiatives from Nepal Rastra Bank have accelerated the adoption of mobile banking and digital payment systems across the country [3]. QR-based payment systems have become one of the most widely adopted digital

payment technologies due to their simplicity and cost-effective implementation.

Despite these advancements, digital banking adoption within Nepal's cooperative financial institutions remains relatively limited compared to commercial banks. Cooperative banks play a critical role in Nepal's financial ecosystem by providing savings and credit services to community members and rural populations. However, many cooperative institutions still rely on traditional banking methods and lack the technological infrastructure necessary to implement large-scale digital banking systems.

The Cooperative Bank of Nepal operates as a central financial institution that supports numerous cooperative societies across the country. These cooperatives collectively serve a large population of members and contribute significantly to grassroots' economic development. As digital financial services expand across Nepal's banking sector, evaluating the scalability of digital banking platforms within cooperative institutions has become increasingly important.

Scalability refers to the ability of a system to handle increasing workloads, transaction volumes, and users without reducing system performance. For digital banking platforms, scalability ensures that systems can support growing numbers of users and transactions efficiently while maintaining security and reliability.

This study examines the scalability of QR payment systems and internet-based member portals, while identifying the barriers preventing the deployment of a dedicated mobile banking application. Related work

Digital Financial Services and Financial Innovation

Digital banking technologies have significantly improved financial service accessibility worldwide. Mobile banking platforms enable customers to perform various financial activities such as balance inquiries, fund transfers, bill payments, and digital payments through mobile applications. These technologies reduce transaction costs and allow financial institutions to provide services to remote populations [4].

Research indicates that digital banking systems contribute to financial inclusion by expanding access to banking services for individuals who previously lacked access to traditional financial institutions [5].

Technology Adoption in Mobile Banking

Technology adoption models such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) have been widely used to explain user behavior in digital banking environments.

According to TAM, perceived usefulness and perceived ease of use are major factors influencing technology adoption. Users are more likely to adopt mobile banking systems if they believe the technology improves efficiency and simplifies financial transactions [6].

Security and trust are also important determinants of mobile banking adoption. Studies indicate that concerns regarding data security and financial fraud can influence user acceptance of digital financial technologies [7].

QR Payment Systems

QR code payment systems have gained popularity due to their low cost and ease of implementation. QR payments allow customers to complete transactions by scanning merchant QR codes using mobile banking applications. This eliminates the need for traditional card payment terminals and reduces infrastructure costs for merchants [8].

QR payment systems have been widely implemented in emerging digital payment ecosystems and have become an important driver of cashless transactions.

Digital Banking in Nepal

Nepal Rastra Bank has introduced several policies to strengthen digital financial infrastructure and encourage digital payment adoption. These initiatives include interoperable QR payment systems, digital wallets, and national payment gateways [3].

Recent reports indicate that digital payment transactions in Nepal have increased significantly, reflecting growing consumer adoption of mobile banking and QR-based payment technologies [9].

This finding aligns with organizational readiness theories, which suggest that successful digital transformation depends not only on technological infrastructure but also on leadership commitment, workforce capability, resource availability, and institutional preparedness for change [10].

However, research examining digital banking scalability within cooperative banking institutions remains limited, highlighting the need for further investigation in this area.

Research Methodology

This study adopts a mixed-method research design to evaluate the scalability of QR payment systems and mobile banking services within the Cooperative Bank of Nepal. The mixed-method approach combines quantitative analysis of user adoption patterns with qualitative insights from institutional stakeholders, allowing a more comprehensive understanding of digital banking scalability.

Research Design

The research follows a descriptive and analytical design. The descriptive component examines the current adoption level of digital banking services such as QR payments and mobile banking platforms among cooperative members. The analytical component evaluates factors affecting the scalability of these digital services within a cooperative banking infrastructure.

Data Collection

Primary data were collected using structured questionnaires and interviews. Questionnaires were distributed to cooperative members and banking staff to gather information regarding:

1. Usage of mobile banking services
2. Adoption of QR payment systems
3. Frequency of digital transactions
4. Perceived challenges in using digital banking services

In addition, semi-structured interviews were conducted with cooperative bank managers and technical staff to understand operational challenges, system integration issues, and technological limitations affecting digital banking scalability.

Sampleand Participants

The study included participants from the Cooperative Bank of Nepal and affiliated cooperative institutions. The sample

consisted of:

1. 140 cooperative members, representing users of banking services
2. 60 banking staff members, representing institutional stakeholders

These participants were selected to provide insights into both user adoption behavior and institutional capacity for digital banking implementation.

Data Analysis

Collected data were analyzed using statistical techniques and descriptive analysis. Quantitative survey responses were processed using statistical tools such as SPSS to determine adoption patterns, frequency of use, and user perceptions regarding digital banking services.

Qualitative responses from interviews were analyzed through thematic analysis, identifying recurring themes related to infrastructure limitations, digital literacy challenges, and institutional barriers.

Results and Analysis

This section presents the findings derived from the survey conducted among cooperative members and staff affiliated with the Cooperative Bank of Nepal. The analysis focuses on digital service adoption, usage frequency, and barriers affecting scalability of QR and mobile banking systems.

Adoption of Digital Banking Services

The survey results indicate varying levels of adoption across different digital services offered by the Cooperative Bank of Nepal. QR-based payment systems and digital member portals show the highest adoption levels among cooperative members. QR payment systems and mobile banking platforms in the Cooperative Bank of Nepal demonstrate moderate but promising scalability potential.

Adoption of Digital Banking Services

Table 1:

Digital Service	Adoption Rate
QR Payment System	60.7%
Member Portal / Online Banking	60.0%
SMS / Email Alerts	52.9%
ATM Services	6.4%
Mobile Banking Service	Not Yet Implemented

Digital Services and Adoption Rates in Cooperatives

While internet banking adoption stands at 60%, its scalability is limited by a lack of transactional depth and the absence of a dedicated mobile application." "The analysis reveals that QR systems show the highest scalability potential (recording over 2,000 daily transactions and over NPR 4 crore volume specifically for the QR) whereas the lack of mobile banking creates a gap between user demand and institutional readiness.

In contrast, services such as ATM integration and digital loan repayment systems show extremely low adoption rates, indicating that these services have not yet achieved significant scalability within the cooperative banking sector.

Additionally:

- Scalability is currently limited by a lack of a mobile banking platform and restricted features in the existing internet portal.
- Major constraints include a lack of sufficient specialized workforce and policies that limit cross-system integration.
- As of February 28, 2026, NCBL has waived annual fees for SMS Alerts and Internet Banking to encourage the shift from cash to digital, despite the absence of a mobile app.

Frequency of Digital Banking Usage

The survey also examined how frequently cooperative members use digital banking services.

Frequency of Digital Banking Usage

Table 2:

Usage Frequency	Percentage
Daily	58.8%
Weekly	15.1%
Monthly	13.4%
Rarely	12.7%

Frequency of the use of Digital Services in Cooperatives

The results indicate that 58.8% of respondents use digital banking services daily, suggesting that digital platforms are becoming an important component of routine financial transactions.

However, approximately 30% of respondents use digital services only occasionally, indicating that traditional banking methods such as cash transactions and branch visits are still prevalent among a significant portion of cooperative members.

Barriers to Digital Banking Adoption

The study also identified several barriers that affect the adoption and scalability of digital banking services within cooperative institutions.

Major Barriers to Digital Banking Adoption

Table 1:

Barrier	Percentage
Preference for cash transactions	38.1%
Lack of digital devices	19.0%
Internet connectivity issues	14.3%
Limited digital literacy	Remaining respondents

Barriers for not Using Digital Services in Cooperatives

The results indicate that cash transaction habits remain the primary barrier to digital banking adoption, with 38.1% of respondents preferring traditional cash-based transactions.

In addition, lack of access to digital devices and unreliable internet connection also limits the use of mobile banking services in some regions.

Digital Banking Challenges

Despite the increasing adoption of digital financial services, several challenges continue to affect the effective implementation and scalability of QR payment systems and mobile banking platforms within the Cooperative Bank of Nepal. These challenges arise from technological, institutional, and behavioral factors that influence the overall adoption of digital banking services.

One of the major challenges identified in the study is the continued reliance on cash-based transactions among cooperative members. A significant portion of respondents indicated a preference for traditional cash transactions due to familiarity, perceived convenience, and concerns regarding digital transaction security. This behavioral factor slows the transition toward fully digital financial systems.

Another important challenge is the limited availability of digital devices and technological resources among cooperative members. Some users do not possess smartphones or reliable internet-enabled devices required to access mobile banking platforms or QR payment systems. This limitation restricts the accessibility of digital banking services for certain segments of cooperative members.

Internet connectivity issues also represent a critical barrier, particularly in rural and semi-urban regions where many cooperative institutions operate. Digital banking platforms depend heavily on stable internet connections for transaction processing. Poor connectivity can result in transaction delays, service interruptions, and reduced user confidence in digital financial systems.

The study also highlights the issue of digital literacy among cooperative members. Many users lack sufficient knowledge and experience in using mobile banking applications or digital payment systems. Without adequate awareness and training programs, users may hesitate to adopt digital banking services even when such services are available.

In addition, institutional and technical limitations within cooperative banking organizations can hinder the expansion of digital services. Cooperative banks often operate with limited financial and technical resources, making it difficult to invest in advanced banking infrastructure, cybersecurity systems, and integrated digital platforms.

Despite the challenges, the research findings indicate that QR-based payment systems provide the most scalable digital financial solution for cooperative banking institutions and addressing these challenges requires coordinated efforts involving financial institutions, regulatory authorities, and technology providers. Strengthening digital infrastructure, promoting digital literacy programs, and improving interoperability between cooperative banking systems and national payment networks are essential steps toward supporting the long-term scalability of digital banking services in Nepal's cooperative sector.

Discussion

The results provide several insights into the scalability of QR payment systems and mobile banking platforms within Nepal's cooperative banking ecosystem. While digital banking scalability within Nepal's cooperative banking sector is currently developing rather than fully mature, the existing adoption levels and technological frameworks demonstrate strong potential for future large-scale expansion.

First, the high adoption rate of QR payment systems (60.7%) suggests that QR technology represents the most scalable digital payment solution for cooperative institutions. QR payments require minimal infrastructure and can be easily implemented by small merchants and cooperative members using smartphones.

Second, the widespread use of member portals and member portals (60.0%) demonstrates that cooperative members are increasingly adopting digital financial services for routine transactions such as balance inquiries and fund transfers.

However, the analysis also reveals significant challenges affecting digital banking scalability by the development of a mobile application-based infrastructure

One of the major barriers is the strong cultural reliance on cash transactions, which remains common among cooperative members. Even when digital services are available, many users continue to prefer cash due to familiarity and perceived convenience.

Another challenge relates to digital infrastructure limitations, particularly in rural areas where internet connectivity may be unstable. Mobile banking systems rely heavily on reliable network infrastructure, and connectivity issues can significantly affect system performance and user experience.

Digital literacy is another critical factor affecting adoption. Many cooperative members lack experience using mobile applications and digital financial technologies. Without proper training and awareness programs, these users may be reluctant to adopt digital banking services.

Institutional capacity also plays an important role in determining scalability. Cooperative banks often operate with limited financial and technical resources, which can restrict their ability to invest in advanced digital banking infrastructure.

Addressing these challenges requires coordinated efforts involving financial institutions, regulatory authorities, and technology providers to strengthen the digital financial ecosystem.

Conclusion

This study evaluated the scalability of QR payment systems and mobile banking services within the Cooperative Bank of Nepal. The findings indicate that digital banking technologies are gradually being adopted within the cooperative banking sector, particularly QR payment systems and mobile banking platforms.

QR payment systems have emerged as the most widely adopted digital payment solution among cooperative members due to their simplicity, accessibility, and low infrastructure requirements. Mobile banking platforms also provide important opportunities for improving access to financial services.

However, several challenges continue to limit the scalability of digital banking services within cooperative institutions. These include strong reliance on cash transactions, limited digital literacy among cooperative members, infrastructure limitations such as internet connectivity, and institutional resource constraints.

To support sustainable digital transformation within Nepal's cooperative banking sector, it is essential to invest in digital infrastructure development, strengthen digital literacy programs, and enhance interoperability between cooperative banking systems and national payment networks.

By addressing these challenges, cooperative financial institutions can leverage digital banking technologies to improve service delivery, increase operational efficiency, and promote financial inclusion across Nepal.

Future Work

Future research may explore advanced technologies that can further improve the scalability and efficiency of digital banking systems in cooperative institutions.

Technologies that could play an important role in strengthening the digital financial ecosystem and supporting the long-term digital transformation of Nepal's cooperative banking sector.

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