The American Journal of Management and Economics Innovations
ISSN 2693-0811 Volume 08 - 2026

# Methods for Ensuring the Stability of Information Transmission Systems in Digital Banking Services

Abrayeva Mahliyo
Senior lecturer of the “Information systems and technologies” department of Tashkent State University of Economics, Uzbekistan

Received: 03 Feb 2026 | Received Revised Version: 22 Feb 2026 | Accepted: 10 Mar 2026 | Published: 31 Mar 2026

Volume 08 Issue 03 2026 | Crossref DOI: 10.37547/tajmei/Volume08Issue03-04

## Abstract

*This artcle examines the issues of ensuring the stability of information transmission systems in digital banking services. In particular, the study focuses on the operating principles of information transmission modules used in ATM and infokiosk systems, their reliability indicators, and their impact on service efficiency. The research identifies technical failures, communication disruptions, and information security challenges that arise in modern digital infrastructure. Based on this, effective methods for improving system stability are proposed. Special attention is given to the role of monitoring systems, backup communication channels, and technical diagnostics in ensuring continuous and reliable data transmission in ATM and infokiosk networks. The study demonstrates that improving the stability of information transmission systems contributes to enhancing the quality of banking services, reducing operational risks, and ensuring higher reliability of customer service in digital banking environments.*

Keywords: Digital banking services, banking infrastructure, ATM, infokiosk, information transmission systems, stability, reliability, technical diagnostics, monitoring systems, communication channels, digital economy, operational efficiency.



**Cite This Article:** Abrayeva Mahliyo. (2026). Methods for Ensuring the Stability of Information Transmission Systems in Digital Banking Services. The American Journal of Management and Economics Innovations, 8(3), 58–64. https://doi.org/10.37547/tajmei/Volume08Issue03-04

## 1. Introduction

In recent years, the rapid development of the digital economy has significantly transformed the banking sector, leading to the widespread implementation of digital banking services. Modern banking systems increasingly rely on automated service channels such as Automated Teller Machines (ATMs) and infokiosks, which provide customers with fast, convenient, and continuous access to financial services. In this context, the efficiency and reliability of information transmission systems play a crucial role in ensuring the uninterrupted operation of these devices. Information transmission systems serve as the backbone of digital banking infrastructure, enabling real-time data exchange between banking servers and remote service devices. In ATM and infokiosk networks, these systems are responsible for processing transactions, verifying user data, and maintaining secure communication channels. Any disruption in data transmission may lead to transaction delays, system failures, or even financial losses, thereby negatively affecting customer trust and overall service quality.

With the increasing complexity of digital banking environments, ensuring the stability of information transmission systems has become a critical challenge. Factors such as network congestion, hardware

malfunctions, software errors, and cybersecurity threats can significantly impact system performance. Therefore, the development and implementation of effective methods for maintaining system stability are essential for improving operational efficiency and minimizing risks.

This study aims to analyze the stability of information transmission systems in digital banking services, with a particular focus on ATM and infokiosk infrastructures. The research explores key reliability indicators, identifies potential sources of system instability, and proposes practical approaches for enhancing system performance. Special emphasis is placed on the use of monitoring tools, backup communication channels, and technical diagnostics to ensure continuous and secure data transmission.

The significance of this research lies in its contribution to improving the reliability and efficiency of digital banking services. By enhancing the stability of information transmission systems, banks can provide higher-quality services, reduce operational disruptions, and strengthen customer confidence in modern banking technologies.

In addition to their functional importance, ATM and infokiosk systems have become essential components of modern banking infrastructure, especially in regions where digital transformation is rapidly progressing. These systems reduce the workload of traditional bank branches and enable financial inclusion by providing services in remote and underserved areas. However, their effectiveness is directly dependent on the stability and reliability of underlying information transmission systems. The increasing volume of transactions and the demand for real-time processing require high-performance communication networks capable of handling large-scale data exchange with minimal latency. In ATM and infokiosk environments, even short-term interruptions in connectivity may result in incomplete transactions, data inconsistencies, or system downtime. Therefore, maintaining uninterrupted communication between devices and central banking systems is a key requirement for sustainable digital banking operations.

Moreover, the integration of advanced technologies such as cloud computing, Internet of Things (IoT), and secure communication protocols has introduced new opportunities as well as challenges. While these technologies enhance system capabilities, they also increase system complexity, making stability management more difficult. As a result, banks must adopt comprehensive strategies that combine technical, organizational, and economic approaches to ensure system resilience.

## 2. Literature Review

In recent studies, the reliability of digital banking systems has been widely discussed in the context of financial stability and service quality. According to Mishkin (2019), the efficiency of financial systems is closely related to the reliability of technological infrastructure that supports transaction processing. Similarly, Rose and Hudgins (2018) emphasize that modern banking services increasingly depend on automated systems, where operational failures may lead to significant financial and reputational losses. From a technological perspective, the stability of information transmission systems has been extensively analyzed within the framework of computer networking. Kurose and Ross (2021) highlight that network performance, latency, and packet loss directly influence the reliability of distributed systems, including banking infrastructures. Tanenbaum and Wetherall (2019) also note that communication protocols and network architecture play a critical role in ensuring uninterrupted data exchange between system components.

Furthermore, international organizations have addressed the importance of operational resilience in financial systems. The Basel Committee on Banking Supervision (2021) underlines that banks must develop robust mechanisms to ensure continuity of critical operations, even under adverse conditions. In this context, the stability of information transmission systems is considered a fundamental requirement for maintaining operational resilience.

In addition, cybersecurity has become an essential aspect of digital banking stability. The European Central Bank (2020) emphasizes that secure communication channels and protection against cyber threats are necessary to prevent data breaches and unauthorized access. These factors directly affect the reliability and trustworthiness of ATM and infokiosk services.

Recent research also focuses on the performance of ATM networks under varying operational conditions. Sharma and Gupta (2020) analyze the reliability of communication networks in banking systems and conclude that system failures are often associated with network congestion and hardware limitations. Similarly, Kumar and Singh (2019) demonstrate that the

performance of ATM networks significantly depends on load conditions and system configuration.

Overall, the reviewed literature indicates that the stability of information transmission systems is a multidimensional issue that combines technical reliability, economic efficiency, and security considerations. Despite the extensive research in this area, there remains a need for integrated approaches that address both technological and operational aspects of system stability in ATM and infokiosk networks.

## 3. Methodology

To better understand this process, the interaction between system components can be represented as follows (Figure 1):

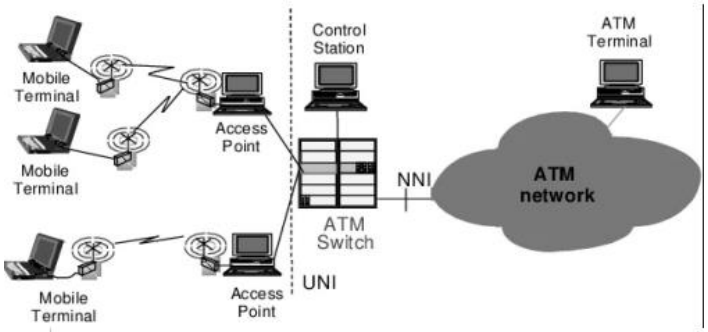


**Figure 1. Architecture of Information Transmission in ATM and Infokiosk Network Systems.**

The figure illustrates the architecture of information transmission within ATM and infokiosk network systems in a digital banking environment. The model demonstrates the interaction between mobile terminals, access points, ATM switch, control station, and the central ATM network.

Mobile terminals and infokiosk-like devices connect to the system through access points, which serve as intermediaries for data transmission. These access points ensure the initial communication between user-side devices and the core banking infrastructure. The ATM switch acts as a central processing unit that manages transaction routing, authentication processes, and communication control.

The connection between the ATM switch and the ATM network is established through standardized interfaces such as UNI (User Network Interface) and NNI (Network-to-Network Interface), which provide structured and secure data exchange. The control station monitors system performance and ensures operational stability by detecting and managing potential faults in real time.

This architecture highlights the importance of stable communication channels and coordinated interaction between system components. Any disruption at one stage of the transmission process may affect the overall performance of ATM and infokiosk services, emphasizing the need for reliable and efficient information transmission systems.

To better illustrate the operational sequence and data exchange processes within ATM systems, it is essential to present a structured model of transaction flow. Understanding how information is transmitted between the customer, ATM machine, and banking infrastructure provides deeper insight into system stability and performance.

In particular, ATM transactions involve multiple stages of interaction, including user authentication, transaction request processing, authorization, and service execution. Each of these stages requires continuous and reliable communication between system components. Therefore, analyzing the transaction flow allows for identifying critical points where system instability may occur.

The following figure presents a detailed model of the transaction process in ATM systems, highlighting the sequence of operations and the flow of information between key components (Figure 2):

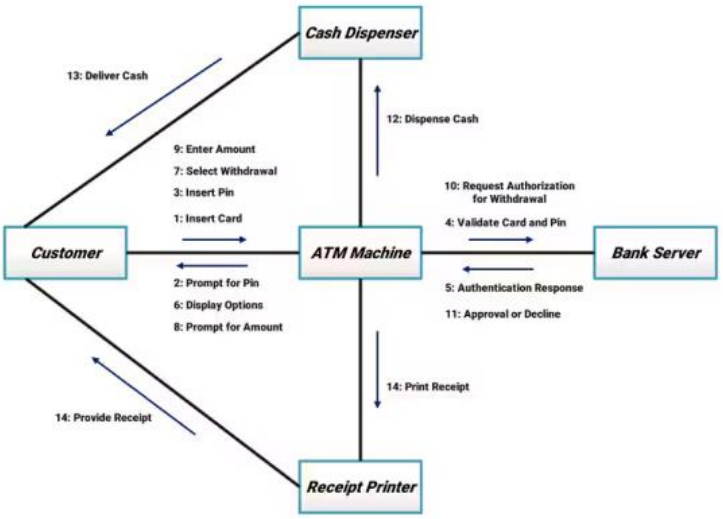


**Figure 2. ATM Transaction Process and Information Flow Model.**

The model presented in Figure 2 clearly demonstrates the sequential structure of ATM transaction processing and the corresponding flow of information between system components. Each stage of the transaction involves a specific exchange of data, which must be performed accurately and without interruption.

The process begins with user interaction, including card insertion and PIN verification, followed by the selection of transaction type and input of the requested amount. These operations generate data that must be transmitted to the bank server for authentication and authorization. The response from the server determines whether the transaction is approved or declined.

A critical aspect of this process is the dependence on stable communication channels between the ATM machine and the central banking system. Any delay or disruption during authentication or authorization stages may result in transaction failure or incomplete operations. This highlights the importance of ensuring high reliability and minimal latency in information transmission systems.

Furthermore, the involvement of peripheral components such as the cash dispenser and receipt printer requires synchronized operation with the core system. These devices depend on timely and accurate signals from the ATM controller, which in turn relies on successful data exchange with the server.

The analysis of this model confirms that the stability of ATM and infokiosk systems is determined by the coordinated interaction of hardware, software, and communication subsystems. Therefore, the implementation of robust transmission protocols, real-time monitoring, and fault-tolerant mechanisms is essential for maintaining system performance and service continuity.

## 4. Results

The stability of information transmission systems in ATM and infokiosk infrastructures can be evaluated using reliability theory and performance indicators. One of the fundamental models used to describe system reliability is the exponential reliability function:

$$R(t)=e^{(-\lambda t)} \quad (1)$$

where:

R(t)-system reliability probability over time,

λ-failure rate of the system,

t-operating time.

This model shows that as operating time increases, the probability of failure-free operation decreases. In ATM and infokiosk systems, maintaining a low failure rate is essential for ensuring uninterrupted service.

Another important indicator of system performance is availability:

$$A=MTBF/(MTBF+MTTR) \quad (2)$$

where:

MTBF – Mean Time Between Failures,

MTTR – Mean Time To Repair.

High availability indicates that the system operates with minimal downtime, which is critical for real-time banking services.

The structure of the information transmission system can be represented conceptually as follows:

**User Device (ATM / Infokiosk) → Access Point → Communication Network → ATM Switch → Bank Server.**

In this scheme:

- ATM and infokiosk devices initiate transactions;

- access points provide network connectivity;

- communication networks transmit data;

- ATM switch manages routing and control;

- bank server processes and stores transaction data.

The stability of the entire system depends on the reliability of each component. Failure in any stage may disrupt the overall operation.

In modern digital banking environments, the stability of information transmission systems plays a decisive role in ensuring uninterrupted financial services. ATM and infokiosk infrastructures operate as distributed systems, where each component is interconnected through communication networks. The effectiveness of such systems depends on the ability to maintain continuous and secure data exchange between end-user devices and central banking servers.

One of the primary challenges in maintaining system stability is the dependence on network connectivity. ATM and infokiosk devices often operate in geographically diverse locations, including areas with limited or unstable network coverage. In such conditions, communication disruptions may occur due to signal degradation, network congestion, or infrastructure limitations. These issues can lead to delays in transaction processing or temporary service unavailability.

Another important factor affecting system stability is the technical condition of hardware components. Communication modules, routers, and switching devices must function reliably under varying operational conditions. Over time, hardware degradation and environmental factors such as temperature fluctuations or power supply instability may negatively impact system performance. Therefore, regular maintenance and timely replacement of critical components are essential for sustaining operational reliability.

Software reliability also plays a crucial role in ensuring stable system performance. Errors in system configuration, outdated software versions, or incompatibility between different communication protocols may result in data transmission failures. To address these challenges, banks must implement standardized protocols and regularly update system software to ensure compatibility and security.

Furthermore, cybersecurity has become an integral aspect of system stability. As ATM and infokiosk systems handle sensitive financial data, they are potential targets for cyberattacks. Unauthorized access, data interception, or malicious interference may disrupt normal system operations and compromise data integrity. Implementing strong encryption methods, secure authentication mechanisms, and continuous security monitoring is necessary to mitigate these risks.

Improving the stability of information transmission systems directly contributes to the overall operational efficiency of banking services. Stable systems ensure faster transaction processing, reduce service interruptions, and enhance customer satisfaction. In ATM and infokiosk networks, this is particularly important as users expect immediate and reliable access to banking services at any time.

One effective approach to enhancing system stability is the implementation of redundancy mechanisms. By introducing backup communication channels, such as alternative network connections, the system can continue to operate even if the primary channel fails. This significantly reduces the risk of complete service disruption.

Another important method is the use of real-time monitoring systems. These systems continuously analyze network performance and detect anomalies before they develop into critical failures. Early detection allows for rapid intervention, minimizing downtime and maintaining service continuity.

In addition, predictive maintenance strategies can be applied to identify potential failures in advance. By analyzing historical performance data, banks can forecast possible system issues and take preventive measures.

This approach not only improves system stability but also reduces maintenance costs. With the ongoing advancement of digital technologies, new opportunities are emerging for improving the stability of information transmission systems. The integration of artificial intelligence and machine learning techniques enables more accurate prediction of system behavior and automated decision-making in network management.

Moreover, the adoption of advanced communication technologies, such as high-speed wireless networks and cloud-based infrastructures, provides greater flexibility and scalability. These technologies allow banks to handle increasing volumes of transactions while maintaining high levels of performance and reliability.

In the future, the development of intelligent and self-adaptive systems will play a key role in ensuring the stability of ATM and infokiosk networks. Such systems will be capable of automatically adjusting to changing conditions, optimizing resource allocation, and preventing failures without human intervention.

## 5. Conclusion

In conclusion, the stability of information transmission systems is a fundamental requirement for the effective functioning of digital banking services, particularly in ATM and infokiosk infrastructures. The analysis conducted in this study demonstrates that reliable communication between system components ensures uninterrupted transaction processing and enhances the overall quality of banking services.

The research highlights that system stability is influenced by multiple factors, including network reliability, hardware performance, software compatibility, and cybersecurity measures. Any disruption in these elements may lead to operational inefficiencies, transaction failures, and reduced customer trust. Therefore, maintaining a high level of system stability is essential for minimizing risks and ensuring continuous service availability.

The study also emphasizes the importance of implementing advanced solutions such as redundant communication channels, real-time monitoring systems, and predictive maintenance strategies. These approaches significantly improve system resilience and reduce the likelihood of unexpected failures in ATM and infokiosk networks.

Furthermore, the integration of modern technologies, including artificial intelligence and advanced communication infrastructures, offers new opportunities for enhancing system performance and adaptability. Such innovations enable more efficient management of information transmission processes and support the development of intelligent and self-regulating banking systems.

Overall, improving the stability of information transmission systems contributes to higher operational efficiency, better service quality, and increased customer satisfaction in digital banking environments. The findings of this study can be used as a basis for further research and practical implementation in the optimization of ATM and infokiosk systems.

## References

1. Mishkin, F. S. (2019). The Economics of Money, Banking, and Financial Markets (12th ed.). Pearson.
2. Rose, P. S., & Hudgins, S. C. (2018). Bank Management and Financial Services (10th ed.). McGraw-Hill.
3. Basel Committee on Banking Supervision. (2021). Principles for Operational Resilience. Bank for International Settlements.
4. Federal Reserve System. (2019). Retail Payments Risk Forum: Cybersecurity and Financial Services.
5. Gai, K., Qiu, M., & Sun, X. (2018). A survey on FinTech. Journal of Network and Computer Applications, 103, 262–273.
6. Baltaev, J., & Abrayeva, M. (2025). Characteristics of microprocessor devices in the banking sector and analysis of their diagnostic objects. American Journal of Modern World Sciences, 2(1), 223–235. Retrieved from https://worldejurnal.ru/index.php/ajmws/article/view/551.
7. Abrayeva, M. O. (2025). Bank sohasidagi axborot uzatish modullarining texnik ekspluatatsiyalari va hayotiy davri. “Raqamli iqtisodiyot” ilmiy-elektron jurnali, maxsus son. 730–739. Retrieved from https://portfolio.afu.uz/storage/documents/ctYtBeV36X0POHLoKWffdZq41j2WooBBEbgFbchC.pdf.
8. Abrayeva M.O, “Texnik diagnosnika usullari orqali bank sohasidagi bankomat qurilmalarining (mikroprotsessorli qurilmalarining) ishonchliligini oshirish”, “Raqamli iqtisodiyot va sun’iy intellekt texnologiyalarining jamiyat rivojlanishidagi ahamiyati” mavzusidagi xalqaro ilmiy-amaliy konferensiya 2024-yil 22-noyabr, Toshkent,

O‘zbekiston, 2294-2301-betlar.

**9.** Alekseev E.B., Gordienko V.N., Krukhmalev V.V., Mochenov A.D., Tveretskiy M.S. Bank avtomatlashtirilgan axborot tizimlarini loyihalash va texnik ekspluatatsiya. Moskva: Finansy i Statistika, 2010. 368 s.

**10.** Амирсаидов У.Б., Аббасханова Х.Ю., Балтаев Ж.Б. Методы оценки надежности сети передачи данных с учётом воздействия внешних факторов, ВЕСТНИК ТашГТУ, 4/2014г., стр 27-31.