

MUHANDISLIK

& IQTISODIYOT

ijtimoiy-iqtisodiy, innovatsion texnik,
fan va ta'limga oid ilmiy-amaliy jurnal

2026-YIL
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05.00.00 - Texnika fanlari

08.00.00 - Iqtisodiyot fanlar



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ИМЕНИ Г.В. ПЛЕХАНОВА
ТАШКЕНТСКИЙ ФИЛИАЛ



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Elektron nashr, 2026-yil, iyun.

Bosh muharrir:

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Bosh muharrir o'rinbosari:

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Pardaev Umidjon Uralovich, iqtisodiyot fanlari doktori (DSc), professor

Xolmirzayev Ulug'bek Abdulazizovich, Iqtisodiyot fanlari doktori (DSc)

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- 05.01.01 – Muhandislik geometriyasi va kompyuter grafikasi. Audio va video texnologiyalari
- 05.01.02 – Tizimli tahlil, boshqaruv va axborotni qayta ishlash
- 05.01.03 – Informatikaning nazariy asoslari
- 05.01.04 – Hisoblash mashinalari, majmualari va kompyuter tarmoqlarining matematik va dasturiy ta'minoti
- 05.01.05 – Axborotlarni himoyalash usullari va tizimlari. Axborot xavfsizligi
- 05.01.06 – Hisoblash texnikasi va boshqaruv tizimlarining elementlari va qurilmalari
- 05.01.07 – Matematik modellashtirish
- 05.01.11 – Raqamli texnologiyalar va sun'iy intellekt
- 05.02.00 – Mashinasozlik va mashinashunoslik
- 05.02.08 – Yer usti majmualari va uchish apparatlari
- 05.03.02 – Metrologiya va metrologiya ta'minoti
- 05.04.01 – Telekommunikatsiya va kompyuter tizimlari, telekommunikatsiya tarmoqlari va qurilmalari. Axborotlarni taqsimlash
- 05.05.03 – Yorug'lik texnikasi. Maxsus yoritish texnologiyasi
- 05.05.05 – Issiqlik texnikasining nazariy asoslari
- 05.05.06 – Qayta tiklanadigan energiya turlari asosidagi energiya qurilmalari
- 05.06.01 – To'qimachilik va yengil sanoat ishlab chiqarishlari materialshunosligi
- 05.08.03 – Temir yo'l transportini ishlatish
- 05.08.06 – "G'ildirakli va gusenisali mashinalar va ularni ishlatish" (texnika fanlari)
- 05.09.01 – Qurilish konstruksiyalari, bino va inshootlar
- 05.09.04 – Suv ta'minoti. Kanalizatsiya. Suv havzalarini muhofazalovchi qurilish tizimlari
- 10.00.06 – Qiyosiy adabiyotshunoslik, chog'ishtirma tilshunoslik va tarjimashunoslik
- 10.00.04 – Yevropa, Amerika va Avstraliya xalqlari tili va adabiyoti
- 08.00.01 – Iqtisodiyot nazariyasi
- 08.00.02 – Makroiqtisodiyot
- 08.00.03 – Sanoat iqtisodiyoti
- 08.00.04 – Qishloq xo'jaligi iqtisodiyoti
- 08.00.05 – Xizmat ko'rsatish tarmoqlari iqtisodiyoti
- 08.00.06 – Ekonometrika va statistika
- 08.00.07 – Moliya, pul muomalasi va kredit
- 08.00.08 – Buxgalteriya hisobi, iqtisodiy tahlil va audit
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- 08.00.10 – Demografiya. Mehnat iqtisodiyoti
- 08.00.11 – Marketing
- 08.00.12 – Mintaqaviy iqtisodiyot
- 08.00.13 – Menejment
- 08.00.14 – Iqtisodiyotda axborot tizimlari va texnologiyalari
- 08.00.15 – Tadbirkorlik va kichik biznes iqtisodiyoti
- 08.00.16 – Raqamli iqtisodiyot va xalqaro raqamli integratsiya
- 08.00.17 – Turizm va mehmonxona faoliyati

Ma'lumot uchun, OAK
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PROBLEMS IN THE DEVELOPMENT OF DIGITAL BANKING SERVICES IN BANKS: TAXONOMY OF BARRIERS AND THEIR INTERDEPENDENCIES

Umurzoqova Adiba Ochilovna

Senior Lecturer, Department of Banking,
Tashkent State University of Economics

Abstract. The rapid expansion of digital banking services has transformed the financial sector; however, their development within established banking institutions remains uneven and often encounters significant obstacles. This study examines the underlying factors that hinder the development of digital banking services in incumbent banks and systematizes these factors through a structured taxonomy of barriers and their interdependencies. The research employs a qualitative, document-based approach, synthesizing findings from peer-reviewed studies published during 2017–2026, recent industry reports, and secondary statistical data. Particular attention is given to the conditions of emerging economies to broaden the analytical perspective beyond high-income financial systems. The findings identify six major categories of barriers: technological and infrastructural, organizational and managerial, data and analytical, security and fraud-related, regulatory and external, and customer and social barriers. The analysis demonstrates that these categories are closely interconnected rather than independent. Legacy core banking systems function as a primary constraint, limiting technological integration, reducing data quality, weakening fraud-response capabilities, and ultimately restricting customer adoption. As a result, a self-reinforcing cycle emerges in which superficial improvements fail to generate sustainable structural transformation. The findings suggest that many commonly observed shortcomings in digital banking development originate from a limited number of root causes rather than isolated technical deficiencies. Therefore, effective digital transformation requires a properly sequenced strategy instead of fragmented and parallel investments. The study contributes a diagnostic taxonomy and an interdependency framework that can assist banks and regulators in distinguishing root causes from symptoms and in setting strategic priorities for digital banking development.

Keywords: digital banking, barriers to development, legacy systems, cybersecurity, data governance, financial inclusion, risk management.

Аннотация. Стремительное распространение цифровых банковских услуг существенно трансформировало финансовый сектор, однако их развитие в традиционных банковских учреждениях остаётся неравномерным и нередко сопровождается значительными трудностями. Исследование направлено на выявление факторов, препятствующих развитию цифровых банковских услуг в действующих банках, а также на их систематизацию посредством структурированной таксономии барьеров и взаимосвязей между ними. В работе использован качественный документальный подход, основанный на синтезе результатов рецензируемых научных исследований, опубликованных в 2017–2026 гг., отраслевых отчётов и вторичных статистических данных. Особое внимание уделено условиям развивающихся экономик, что позволяет расширить аналитическую перспективу за пределы высокодоходных финансовых систем. В результате выделены шесть основных групп барьеров: технологические и инфраструктурные, организационно-управленческие, связанные с данными и аналитикой, связанные с безопасностью и мошенничеством, регуляторные и внешние, а также клиентские и социальные. Установлено, что данные группы барьеров тесно взаимосвязаны и оказывают взаимное влияние. Устаревшие базовые банковские системы выступают ключевым ограничивающим фактором, затрудняя интеграцию технологий, снижая качество данных, ослабляя возможности противодействия мошенничеству и ограничивая уровень принятия цифровых услуг клиентами. В результате формируется самоподдерживающийся цикл, при котором локальные улучшения не обеспечивают устойчивых структурных изменений. Полученные результаты свидетельствуют о том, что многие проблемы развития цифрового банкинга обусловлены ограниченным числом первопричин, а не отдельными техническими недостатками. В связи с этим эффективная цифровая трансформация требует последовательного подхода к реализации изменений вместо разрозненных параллельных инвестиций. Практическая значимость исследования заключается в разработке диагностической таксономии и модели взаимозависимостей, позволяющих банкам и регуляторам выявлять корневые причины проблем и определять приоритетные направления развития цифрового банкинга.

Ключевые слова: цифровой банкинг, барьеры развития, устаревшие системы, кибербезопасность, управление данными, финансовая инклюзия, управление рисками.



Annotatsiya. Raqamli bank xizmatlarining jadal sur'atlarda rivojlanishi moliya sektorida muhim o'zgarishlarni yuzaga keltirdi, biroq ularning an'anaviy banklar faoliyatiga joriy etilishi va rivojlantirilishi hanuzgacha bir xil darajada kechmayapti hamda qator to'siqlarga duch kelmoqda. Tadqiqotda amaldagi banklarda raqamli bank xizmatlarini rivojlantirishga to'sqinlik qilayotgan omillar aniqlanib, ular o'zaro bog'liqliklari bilan birgalikda tizimli taksonomiya asosida tasniflangan. Tadqiqot sifatli hujjatli tahlil usuliga asoslanib, 2017–2026-yillarda chop etilgan taqrizdan o'tgan ilmiy tadqiqotlar, sohaviy hisobotlar hamda ikkilamchi statistik ma'lumotlar sintezi asosida amalga oshirilgan. Tahlilda rivojlanayotgan iqtisodiyotlar sharoitlariga alohida e'tibor qaratilib, masala yuqori daromadli moliyaviy tizimlar doirasidan kengroq ko'lamda yoritilgan. Natijalar raqamli bank xizmatlarini rivojlantirishdagi to'siqlarning oltita asosiy guruhini aniqlash imkonini berdi: texnologik va infratuzilmaviy, tashkiliy va boshqaruv, ma'lumotlar va analitika, xavfsizlik va firibgarlik, tartibga soluvchi va tashqi omillar, shuningdek mijozlar va ijtimoiy omillar bilan bog'liq to'siqlar. Ushbu to'siqlar mustaqil ravishda emas, balki o'zaro chambarchas bog'langan holda namoyon bo'lishi aniqlandi. Eskirgan asosiy bank tizimlari texnologik integratsiyani cheklaydi, ma'lumotlar sifatini pasaytiradi, firibgarlikka qarshi choralar samaradorligini susaytiradi va natijada mijozlarning raqamli xizmatlardan foydalanish darajasiga ta'sir ko'rsatadi. Bu esa yuzaki yaxshilanishlar barqaror tarkibiy o'zgarishlarni ta'minlay olmaydigan o'z-o'zini qo'llab-quvvatlovchi jarayonni shakllantiradi. Tadqiqot natijalari raqamli bank xizmatlarini rivojlantirishdagi ko'plab muammolar alohida texnik kamchiliklardan emas, balki cheklangan miqdordagi asosiy sabablar ta'siridan kelib chiqishini ko'rsatadi. Shu bois raqamli transformatsiya jarayonida parallel xarajatlardan ko'ra, ustuvorliklar asosida ketma-ket amalga oshiriladigan strategik yondashuv muhim ahamiyat kasb etadi. Tadqiqot natijasida ishlab chiqilgan diagnostik taksonomiya va o'zaro bog'liqlik modeli banklar hamda regulyatorlarga muammolarning tub sabablarini aniqlash va rivojlanish ustuvor yo'nalishlarini belgilashda amaliy yordam beradi.

Kalit so'zlar: raqamli bank xizmatlari, rivojlanish to'siqlari, eskirgan tizimlar, kiberxavfsizlik, ma'lumotlarni boshqarish, moliyaviy inklyuziya, risklarni boshqarish.

INTRODUCTION

The development of digital banking services has become a defining task for commercial banks. Customers increasingly regard instant, mobile, and personalized services as a standard expectation, while competition from digital-only institutions and technology platforms has increased the cost of lagging behind. At the same time, the development of these services within established banks remains far from straightforward. Many initiatives are delayed, abandoned, or reduced to cosmetic changes that fail to transform the way banks actually operate. This gap between the apparent ease of digital adoption and the practical challenges of digital development within banks constitutes the central focus of this study.

The difficulty is reflected in recurring patterns across the banking industry. Industry analyses indicate that a substantial share of core banking software continues to operate on systems designed decades ago, that most institutions intend to replace or modernize these systems within a relatively short period, and that several large-scale modernization projects have exceeded their budgets and timelines by significant margins (Deloitte, 2024; American Bankers Association, 2024). Cybersecurity risks have also increased as banking services have moved online, with global banking fraud losses reaching tens of billions of dollars and most security executives reporting difficulties in keeping pace with attackers who increasingly employ artificial intelligence (CoinLaw, 2025; FBI IC3, 2025). From the customer perspective, disparities in digital literacy and access to reliable internet connectivity continue to limit the adoption of digital banking services among certain population groups, despite the overall growth in digital usage (Heliyon, 2024).

These challenges are often examined separately as technical, organizational, or social issues. While the literature on digital finance and financial inclusion has documented each of these dimensions extensively, less attention has been devoted to understanding their interrelationships and distinguishing root causes from resulting effects (Gomber et al., 2017; Access Journal, 2026). Without such an integrated perspective, banks may allocate resources toward addressing the most visible symptoms while leaving underlying structural constraints unresolved. This helps explain why substantial investments frequently generate only limited long-term transformation.

Accordingly, this study pursues three primary objectives. First, it develops a comprehensive taxonomy of the barriers that hinder the development of digital banking services. Second, it examines the interdependencies among these barriers and differentiates root causes from symptoms. Third, it identifies practical implications regarding how banks and regulators should prioritize and sequence their transformation efforts. Based on these objectives, the study addresses the following research questions: What categories of barriers constrain the development of digital banking services? How do these barriers interact with one another? What implications do these interactions have for effective remediation and digital transformation strategies?

LITERATURE REVIEW

The development of digital banking services has become one of the most important directions in the

transformation of modern financial systems. Gomber, Koch, and Siering emphasized that digital finance and FinTech technologies have fundamentally changed the provision of banking services by creating new opportunities for efficiency improvement, innovation, and customer-oriented service delivery [9]. Similarly, Vives highlighted that digital transformation contributes to the modernization of banking business models and strengthens the competitiveness of financial institutions in an increasingly technology-driven environment [13].

The relationship between digital banking and financial inclusion has received considerable attention in the academic literature. Demirgüç-Kunt, Klapper, Singer, and Ansar demonstrated that the expansion of digital payments and remote banking channels significantly increases access to financial services and promotes broader participation in the formal financial system [7]. Supporting this view, research published in *Heliyon* showed that improvements in digital literacy and technology adoption contribute positively to financial inclusion across developing and emerging economies [10]. Furthermore, recent studies have emphasized that digital financial inclusion enhances banking sector performance through improved accessibility and more efficient service delivery mechanisms [14].

Technological modernization and the development of digital infrastructure are widely recognized as key enablers of digital banking growth. According to Deloitte, the modernization of legacy banking systems creates opportunities for greater operational efficiency, flexibility, and innovation [6]. The American Bankers Association also highlights the strategic importance of upgrading core banking platforms to support future digital initiatives [1]. In addition, Accenture and Veritrans underline the growing role of innovative technologies, customer-centric digital solutions, and organizational transformation in accelerating the development of digital banking services and improving customer experience [2; 12].

RESEARCH METHODOLOGY

The study adopts a qualitative, interpretive research design that is well suited to an exploratory investigation of why a complex organizational process often encounters difficulties or fails to achieve its intended outcomes. Rather than testing a single hypothesis, the study develops a taxonomy of barriers and an interdependency model through a comprehensive review and synthesis of secondary evidence. This approach is widely applied in digital transformation research, where complex phenomena cannot be adequately captured through a single dataset or methodological perspective.

Three categories of sources were utilized. The first consisted of peer-reviewed and preprint studies published during 2017–2026, identified through major academic databases using combinations of the keywords *digital banking*, *barriers*, *challenges*, *legacy systems*, *cybersecurity*, *data governance*, and *financial inclusion*. The second category included recent reports published by consulting firms, technology providers, central banks, and cybersecurity organizations. These sources were primarily employed to provide current industry insights and descriptive evidence and were interpreted with appropriate caution. The third category comprised secondary statistical data related to fraud, digital modernization, and service adoption. These data were used to illustrate the scale and direction of observed developments rather than to establish precise causal relationships, as the underlying sources differ in methodology, scope, and observation period.

The analytical process was conducted in two stages. During the first stage, identified barriers and challenges were systematically coded and categorized until they converged into six conceptually distinct groups. During the second stage, the relationships among these groups were examined by tracing whether each reported problem originated within a particular category or emerged as a consequence of barriers located elsewhere in the system. This process enabled the construction of a directional framework illustrating the interaction between causes and effects across different categories of barriers.

Several limitations should be acknowledged. The study relies exclusively on secondary sources that vary in methodological quality and analytical depth. In addition, primary empirical evidence, such as interviews with banking professionals or regulators, was not collected. Furthermore, the proposed interdependency model represents an analytical and conceptual framework rather than a statistically estimated model. These limitations define the scope of the findings and provide a basis for future empirical research.

ANALYSIS AND RESULTS

A Taxonomy of Problems

The synthesis produced six clusters of problems that recur across markets and institution types. They are summarized in Table 1 and then examined in turn. The clusters are presented as analytically separate; however, the subsequent analysis shows that they are tightly interconnected in practice.



Table 1
Taxonomy of Problems in the Development of Digital Banking Services¹

Problem Cluster	Typical Manifestations	Main Consequences
Technological and Infrastructural	Legacy core systems, poor integration, limited scalability, accumulated technical debt	Slow product launches, high maintenance costs, fragile operations
Organizational and Managerial	Skills shortages, resistance to change, misalignment between IT and business units, weak project governance	Delayed or abandoned projects, low return on investment, internal friction
Data and Analytics	Fragmented and low-quality data, weak data governance, limited analytical capacity	Poor personalization, unreliable risk models, missed insights
Security, Fraud, and Trust	Cyberattacks, account takeover, AI-enabled and synthetic identity fraud, data breaches	Financial losses, regulatory penalties, erosion of customer trust
Regulatory and External	Lagging or unclear regulations, heavy compliance burden, third-party and vendor risk, platform competition	Hesitation to innovate, rising compliance costs, dependence, and vendor lock-in
Customer and Social	Low digital literacy, uneven connectivity, low trust, accessibility gaps	Slow adoption, digital exclusion, heightened vulnerability to fraud

Technological and Infrastructural Problems

The most frequently cited obstacle is the legacy core banking system. Many institutions still run critical operations on platforms built decades ago in programming environments that few engineers now master, and the pool of specialists able to maintain them continues to shrink (Deloitte, 2024). These systems were designed for a narrow set of batch operations rather than for continuous, real-time, and programmable services, so connecting them to modern interfaces, instant payments, and analytics tools is slow, costly, and risky.

The consequences extend throughout the development process. New features that should take weeks can require months of integration and testing, the cost of maintenance crowds out investment in innovation, and the rigid architecture makes scaling expensive. Attempts at wholesale replacement carry their own risks. Several large banks have spent substantial sums and many years on core replacement programs, and some have abandoned them after significant losses, which has pushed the industry toward incremental approaches, such as building modern systems alongside the old core and connecting them through programming interfaces (Pfuetze, 2025; American Bankers Association, 2024). The technological cluster is therefore not only a problem in itself but also a constraint that shapes every other area of development.

Organizational and Managerial Problems

Technology rarely fails on its own. A second cluster concerns people and management. Banks face a persistent shortage of staff with skills in cloud engineering, data science, and modern software practices, and they compete for this talent with technology firms that often offer more attractive conditions. Within the organization, employees accustomed to established systems and procedures may resist new tools and workflows when training and support are insufficient (Veritran, 2025).

A further managerial problem is the misalignment between technology teams and business units, where projects drift toward matching the features of competitors rather than toward measurable business outcomes, such as lower operating costs or faster decision-making. Weak project governance compounds this issue, since large transformation programs without clear ownership, staged milestones, and disciplined scope tend to overrun budgets and underdeliver results. The pattern of failed core projects described above is as much a failure of change management as it is of engineering, because modernization disrupts long-established processes and demands behavioral change that is often underestimated.

Data and Analytics Problems

The third cluster concerns data. Advanced digital services depend on data that is accurate, consistent, well organized, and lawfully usable, yet many banks store their data in fragmented repositories inherited from separate systems and acquisitions. Weak data governance, including unclear ownership, inconsistent definitions, and limited quality control, undermines the very capabilities that justify digitalization because personalization, credit scoring, and fraud detection are only as reliable as the data on which they depend.

¹ Author's compilation

This cluster is closely tied to the technological one, since fragmented legacy systems are a primary source of fragmented data. It also limits the safe adoption of artificial intelligence because models trained on poor-quality or biased data can produce unfair or unstable outcomes, which, in turn, increase regulatory and reputational risks. As a result, banks frequently invest in analytical tools and machine-learning capabilities while lacking the data foundation necessary for those tools to perform effectively, causing expected benefits to fall short of expectations.

Security, Fraud, and Trust Problems

As services move online, the attack surface available to malicious actors expands, and the fourth cluster grows rather than diminishes with digitalization. Reported global banking fraud losses have reached tens of billions of dollars, and national crime statistics indicate sharp annual increases in cyber-enabled losses, with a growing proportion attributed to attacks that employ artificial intelligence (CoinLaw, 2025; FBI IC3, 2025). These attacks include phishing and social engineering, account takeover, ransomware, distributed denial-of-service attacks, and synthetic identity fraud, the latter of which now accounts for a significant share of identity-related fraud cases.

Two features make this cluster particularly serious. First, attackers innovate rapidly, and a large majority of security executives report that they are unable to keep pace with adversaries who automate and scale their attacks. Second, the resulting damage is not limited to financial losses. A single data breach or widespread fraud incident can erode the trust on which digital adoption depends, and trust is both costly and time-consuming to rebuild. Academic reviews confirm that perceived insecurity directly suppresses the adoption and growth of digital banking, linking this cluster to the customer-related challenges discussed below (Systematic Review, arXiv, 2025).

Regulatory and External Problems

The fifth cluster lies partly outside the direct control of banks. Regulations governing data protection, digital identity, non-bank service providers, and emerging financial products often lag behind market developments, and uncertainty regarding future requirements may discourage institutions from committing fully to innovation. At the same time, compliance obligations continue to expand, as digital services must simultaneously satisfy data protection regulations, anti-money-laundering requirements, payment security standards, and operational resilience frameworks.

External dependence represents an additional challenge. As banks increasingly rely on cloud providers, payment processors, and fintech partners, they inherit third-party and vendor-related risks, including the possibility of vendor lock-in and disruptions originating outside their own systems. Competition from digital-only banks and large technology platforms further intensifies pressure, while the dominance of a limited number of payment infrastructures in certain markets raises concerns regarding interoperability and the pace of innovation. Consequently, the regulatory cluster both constrains development directly and amplifies risks emerging from other clusters.

Customer and Social Problems

The sixth cluster concerns the people whom digital banking services are intended to serve. Even when banks develop capable digital platforms, adoption may remain limited because of insufficient digital literacy, uneven internet connectivity, low levels of trust, or service designs that fail to accommodate older, less educated, or rural populations. In emerging markets, these challenges are often more pronounced, and research on financial inclusion suggests that digitalization can widen rather than narrow the gap between included and excluded groups when skills and infrastructure remain inadequate (Demirgüç-Kunt et al., 2022; Heliyon, 2024).

This cluster represents the point at which the consequences of other problems become visible to society. Security failures reduce trust, poor-quality data leads to inefficient or unfair services, and rigid technological systems prevent the delivery of simple and reliable user experiences. The customer cluster is therefore both a challenge in its own right and the point at which upstream failures become apparent, making it a useful indicator of whether deeper structural issues have been successfully addressed.

Interdependencies Among the Clusters

The most important finding is that the six clusters form an interconnected system rather than a simple list of separate challenges. Tracing reported failures back to their origins reveals a recurring pattern of influence. Legacy core systems within the technological cluster act as an upstream cause: they fragment data, weakening analytical and risk-management capabilities; they slow the deployment of modern security measures, exacerbating cybersecurity risks; and they hinder the delivery of the smooth and reliable experiences required by customers. Organizational weaknesses determine whether banks can address these issues effectively, while regulatory pressures shape the environment in which such responses occur.

This structure creates a self-reinforcing cycle. Because the core system is difficult to change, banks often add surface-level features instead, increasing complexity and technical debt, which, in turn, makes the core even more difficult to modernize. Poor-quality data weakens analytical performance, reducing incentives for further investment in data improvement. Fragile trust means that any security failure can slow customer adoption, reducing the revenue available to fund stronger security measures. This cycle helps explain a common yet otherwise puzzling



observation: substantial spending on digital banking initiatives often fails to produce meaningful structural improvement because investments target visible symptoms while the underlying constraint remains unresolved.

The taxonomy and the interdependency model together suggest that the challenges of digital banking development are better understood as a limited number of root causes manifested through multiple symptoms. The practical implication is significant. If banks treat each reported problem as a separate technical issue and implement remedies in parallel, they risk spreading resources across symptoms while leaving the underlying causes unresolved. If, instead, they sequence their efforts by addressing technological and organizational foundations before developing the capabilities that depend on them, they can break the self-reinforcing cycle.

This interpretation is consistent with the broader literature, which argues that the lasting effects of digital innovation in banking stem from changes in core processes and industry structures rather than from front-end features alone, and that access to digital services does not automatically guarantee their effective use or benefits (Gomber et al., 2017; Demirgüç-Kunt et al., 2022). It also aligns with security research demonstrating that perceived risk directly suppresses adoption, implying that security and trust cannot be treated as late-stage additions but must be embedded throughout every layer of the digital banking ecosystem (arXiv, 2025). The analysis contributes to this literature by explicitly identifying the direction of influence among barriers, highlighting legacy core systems and the organizational capacity to modernize them as the areas with the greatest strategic leverage.

Several additional themes emerge from the analysis. The evidence on unsuccessful core replacement initiatives indicates that the choice is rarely between maintaining the status quo and undertaking a single large-scale transformation project. Incremental strategies, such as developing modern systems alongside existing core platforms and integrating them through programming interfaces, reduce risk and facilitate organizational learning, suggesting that the approach to modernization is as important as the modernization itself (Pfuetze, 2025). The data cluster also warrants greater attention than it often receives because it occupies a central position between core infrastructure and the advanced capabilities that banks seek to develop. Poor-quality data can quietly undermine investments in analytics and artificial intelligence, limiting their effectiveness. Furthermore, in emerging markets, customer-related and regulatory barriers assume greater importance because deficiencies in digital literacy, connectivity, and consumer protection can transform a technically successful service into one that remains socially exclusive.

Several priorities arise from these findings. For bank management, the primary priority is to treat core modernization and data governance as strategic foundations and to sequence subsequent capabilities accordingly. Progress should be evaluated through measurable business outcomes rather than the number of features introduced. Security and fraud management should be integrated throughout the development process rather than implemented at the final stage, while investments in skills development and change management are essential to ensure that new systems are effectively adopted and utilized. For regulators and policymakers, priorities include establishing clear and proportionate regulatory frameworks, supporting resilient shared infrastructure, monitoring market concentration and vendor dependence, and promoting digital literacy and consumer protection. Because the identified clusters are highly interdependent, these measures are likely to be most effective when implemented in a coordinated manner rather than in isolation.

CONCLUSION AND RECOMMENDATIONS

This paper set out to explain why the development of digital banking services is so difficult for established banks. Through a qualitative synthesis of recent research, industry reports, and secondary statistical data, it organized the obstacles into six clusters: technological and infrastructural, organizational and managerial, data and analytics, security and fraud, regulatory and external, and customer and social. The analysis demonstrated that these clusters form an interconnected system rather than a simple list of independent challenges.

The central finding is that legacy core systems and the organizational capacity required to modernize them function as upstream causes that contribute to weak data quality, heightened security risks, and slower customer adoption. Together, these factors create a self-reinforcing cycle in which surface-level investments fail to generate meaningful structural transformation. The study contributes a diagnostic taxonomy and an interdependency model that can assist banks and regulators in distinguishing root causes from symptoms and in establishing more effective priorities for digital transformation initiatives.

Several limitations should be acknowledged. The study relies primarily on secondary sources that vary in quality and methodological rigor. In addition, the proposed interdependency model is analytical rather than statistically estimated. Future research should validate the model using primary data collected from banking institutions, assess the strength of relationships among the identified clusters, compare these patterns across different emerging markets, and examine how shared public infrastructure and proportionate regulatory frameworks can help alleviate the constraints identified in this study.



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