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Scientific and Methodological Approaches to Assessing Digital Maturity in Formulating Innovative Development Strategies for Commercial Banks

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Abstract: The rapid advancement of digital technologies has fundamentally transformed the competitive environment of the banking sector, making digital maturity a critical determinant in formulating innovative development strategies for commercial banks. This study aims to develop scientific and methodological approaches to assessing the digital maturity of commercial banks as a strategic basis for enhancing innovation-driven growth. The research systematizes theoretical approaches to digital maturity assessment and identifies the key dimensions influencing banks' innovative development, including digital leadership, customer-centricity, digital products and services, business process digitalization, technological infrastructure, data-driven management, cybersecurity, ecosystem integration, and human capital development. Based on these dimensions, an integrated Digital Maturity Assessment Model (DMAM) is proposed to evaluate the level of digital transformation and support strategic decision-making. The study also develops a system of quantitative and qualitative indicators for measuring digital maturity and substantiates their application in selecting appropriate innovation development strategies. The proposed methodological framework enables commercial banks to identify digital capability gaps, prioritize strategic transformation initiatives, improve operational efficiency, strengthen customer value creation, and enhance long-term competitiveness under the conditions of the digital economy. The research findings contribute to the development of digital banking management theory and provide practical recommendations for improving strategic planning and innovation management in commercial banks.

Keywords: Commercial Banks, Digital Maturity, Digital Transformation, Innovation Development Strategy, Digital Banking, Digital Maturity Assessment, Strategic Management, Banking Innovation, Digital Ecosystem, Data-Driven Management, Artificial Intelligence, Innovation Management.

1. Introduction

The accelerating pace of digital transformation has fundamentally reshaped the global banking industry, compelling commercial banks to reconsider their business models, organizational structures, and innovation strategies. The emergence of advanced digital technologies, including artificial intelligence (AI), big data analytics, cloud computing, blockchain, application programming interfaces (APIs), and open banking, has significantly altered the competitive landscape of financial services. In this environment, sustainable competitive advantage increasingly depends on the ability of commercial

banks to develop and effectively implement innovation-oriented digital transformation strategies [1].

Digital maturity has become one of the most important determinants of successful digital transformation. It reflects the extent to which an organization possesses the technological infrastructure, managerial capabilities, organizational culture, digital competencies, and innovation capacity required to create value in the digital economy [2]. Unlike digitalization, which primarily focuses on the adoption of digital technologies, digital maturity represents the institutional readiness of an organization to continuously generate, integrate, and commercialize digital innovations within its strategic management system [3].

In recent years, numerous international organizations and consulting companies, including Deloitte, McKinsey & Company, Gartner, KPMG, and Capgemini, have developed various digital maturity assessment frameworks for financial institutions. These models generally evaluate technological capabilities, customer experience, operational excellence, organizational agility, and innovation capacity [4]. However, most existing approaches are designed as universal maturity models and pay limited attention to the strategic relationship between digital maturity and the formulation of innovation development strategies in commercial banks. Moreover, current methodologies often emphasize technological readiness while insufficiently considering ecosystem integration, digital governance, data-driven management, and human capital development as strategic determinants of innovative growth [5].

The banking sector in emerging economies, particularly in Uzbekistan, is currently experiencing rapid digital transformation driven by government reforms, financial market liberalization, and increasing customer demand for digital financial services. The implementation of the "Digital Uzbekistan – 2030" Strategy and ongoing modernization of the banking system have accelerated investments in financial technologies, digital infrastructure, and innovation ecosystems [6]. Nevertheless, considerable differences remain among commercial banks regarding their levels of digital maturity, innovation capabilities, and strategic readiness for digital transformation. These disparities necessitate the development of scientifically grounded methodological approaches capable of objectively assessing digital maturity and supporting evidence-based strategic decision-making [7].

Despite the growing body of literature on digital banking and innovation management, there remains a limited number of studies proposing comprehensive methodologies that integrate digital maturity assessment with innovation development strategy formulation [8]. Existing research predominantly focuses on technological adoption, whereas insufficient attention has been devoted to developing integrated assessment models that simultaneously evaluate technological, organizational, managerial, ecosystem, and human capital dimensions. Consequently, there is a need for a multidimensional scientific framework capable of measuring digital maturity while providing strategic guidance for commercial banks' innovative development [9].

This study addresses this research gap by proposing scientific and methodological approaches to assessing digital maturity in the context of innovation strategy formulation for commercial banks [10]. The research develops an integrated Digital Maturity Assessment Model (DMAM), which combines key dimensions of digital transformation, including digital leadership, customer-centricity, digital products and services, operational excellence, technological infrastructure, ecosystem integration, cybersecurity, data-driven management, and digital competencies. Furthermore, the study proposes a system of quantitative and qualitative indicators that enables comprehensive evaluation of digital maturity and facilitates the selection of appropriate innovation development strategies [11].

The findings of this research contribute to the theoretical advancement of digital banking management and strategic innovation by extending existing digital maturity frameworks toward an integrated strategic assessment methodology. From a practical perspective, the proposed model provides commercial banks with an effective analytical tool for diagnosing digital capabilities, identifying strategic priorities, improving innovation performance, strengthening competitive advantages, and ensuring sustainable development within the rapidly evolving digital economy [12].

Literature Review. The issue of banking sector reforms and their impact on economic growth has been extensively studied in international scientific literature, and research in this field is primarily focused on assessing the effectiveness of financial intermediation, the stability of the banking system, and the impact of institutional reforms. In scientific views, the development of the banking sector is interpreted as an important driver of economic growth, and financial deepening and the effective distribution of credit resources are shown as the main factors [13].

Bank sector transformation and digital reforms represent one of the most dynamically developing and highly relevant research areas in contemporary financial economics. Existing academic literature primarily focuses on the impact of digital technologies on banking operations, transformation of business models, and improvement of efficiency in financial service delivery. In this context, digitalization is widely recognized as a key driver of structural changes in the banking industry, reshaping both operational processes and strategic management approaches [14].

In the international literature, Richard Baskerville et al. (2020) analyze the impacts, challenges, and trends of digital transformation in the banking sector, emphasizing the role of fintech solutions in automating banking processes and increasing operational efficiency. Similarly, Fotis Kitsios, Ilias Giatsidis, and Maria Kamariotou examine the determinants of e-service adoption in banking, highlighting trust, perceived usefulness, and user acceptance as key factors influencing digital banking diffusion [15].

Panagiotis Boufounou investigate the digital transformation of the banking sector during the COVID-19 period, demonstrating that crises significantly accelerate the adoption of digital banking services. Wellington Gaviyau and John Godi provide a comprehensive analysis of disruptions, regulatory challenges, and opportunities associated with fintech-driven banking transformation.

Peter Campino, António Brochado, and Ana Rosa argue that digital business transformation fundamentally changes strategic banking management and strengthens customer-oriented financial service models. Ivan Tsindeliani link digital transformation of banking systems with sustainable development principles, emphasizing the increasing importance of ESG-oriented financial governance.

Among CIS scholars, Svetlana Galazova and Leyla Magomayeva analyze the transition from traditional to digital banking models, while Peter Modiha explores the institutional implications of digital transformation in the financial sector.

In the context of Uzbekistan, Z. Mamadiyarov empirically investigate the determinants of remote banking service development, highlighting technological and behavioral factors. J. K. Egamberganov analyzes banking sector development under digital economy conditions, emphasizing the institutional importance of digitalization. A. Akimov provides a foundational analysis of financial system reforms in Uzbekistan, while A. Abdullaev and S. Bekmurodova study the transformation of banking regulation under the conditions of the digital economy.

Overall, the literature indicates that the digital transformation of the banking sector is driven by the integration of digital technologies, fintech innovation, institutional reforms, and regulatory adaptation. However, the comprehensive and systemic assessment of banking sector reforms in relation to economic growth and financial stability

remains insufficiently explored, which determines the scientific relevance of the present study.

2. Materials and Methods

This study employs general and specific scientific methods to analyze the economic essence of banking sector transformation and digital reforms, as well as their impact on economic growth and financial stability. In particular, the system-based approach is used to examine the banking sector as an integrated economic system, while the comparative analysis method allows benchmarking the development of Uzbekistan's banking sector against international experience. Methods of abstraction and generalization are applied to identify the main trends and directions of banking sector reforms, whereas induction and deduction are used to derive scientifically grounded conclusions based on the collected information. In addition, statistical analysis is applied to examine the dynamics of key banking sector indicators, and logical as well as economic analysis methods are used to assess the effectiveness of ongoing reforms, thereby ensuring the scientific validity and practical relevance of the research results.

3. Results and Discussion

The accelerating pace of digital transformation has created a growing need to comprehensively assess the digital maturity of commercial banks as a prerequisite for formulating effective innovation development strategies. An objective assessment of digital maturity serves as an important strategic management tool for evaluating a bank's technological capabilities, organizational readiness, managerial efficiency, and innovation potential. The results of such an assessment provide a scientific basis for identifying the current state of digital transformation, determining strategic priorities, and designing long-term innovation-oriented development strategies.

Within the framework of this study, the author proposes the following definition of digital maturity:

Digital maturity is an integrated indicator that comprehensively reflects the technological, organizational, managerial, innovation, and human capital capabilities achieved by a commercial bank during the process of digital transformation, enabling an objective assessment of its readiness to achieve strategic development goals.

The scientific novelty of this definition lies in its broader interpretation of digital maturity. Unlike traditional approaches that primarily focus on the adoption of digital technologies, the proposed definition incorporates innovation capacity, customer-centricity, data-driven management, ecosystem integration, organizational adaptability, and human capital development as essential components of digital maturity.

Assessing the digital maturity of commercial banks enables management to accomplish several strategic objectives:

- Determine the current and target levels of digital maturity;
- Identify bottlenecks and unused opportunities within the digital transformation process;
- Evaluate the bank's innovation capabilities and digital readiness;
- Formulate or revise the bank's innovation development strategy;
- Develop a comprehensive digital transformation roadmap aligned with strategic objectives;
- Monitor the effectiveness of digital transformation initiatives using strategic key performance indicators (kpis).

The practical application of a digital maturity model enables commercial banks to manage transformation processes more effectively while strengthening their competitive

advantages. In particular, such an approach contributes to improving the profitability of digital products and services, enhancing customer satisfaction, reducing operational costs, increasing labor productivity, improving business process flexibility and efficiency, and strengthening overall financial performance. Consequently, digital maturity becomes one of the key determinants of successful innovation-driven development in the banking sector.

A review of both international and domestic practices indicates that numerous methodologies have been developed to assess organizational digital maturity. These methodologies evaluate digital transformation readiness, technological capabilities, organizational development, governance quality, and innovation performance using various assessment criteria.

For the purposes of this research, three of the most recognized and practically applicable methodologies were selected for comparative analysis:

- **The Digital Acceleration Index (DAI)** developed by **Boston Consulting Group (BCG)**;
- **The Digital Readiness Assessment Framework** developed by **KPMG**;
- **The Digital Transformation Readiness Index** developed by the **NAFI Analytical Center** in cooperation with the **Skolkovo Foundation**.

A comparative analysis of these methodologies provides the methodological foundation for developing the **Bank Digital Maturity Assessment Model (BDMAM)** proposed in this study. The model aims to overcome the limitations of existing approaches by integrating technological, organizational, managerial, innovation, ecosystem, and human capital dimensions into a comprehensive assessment framework specifically designed for commercial banks.

Boston Consulting Group (BCG) is one of the world's leading management consulting firms and, together with **McKinsey & Company** and **Bain & Company**, constitutes the so-called "Big Three" in strategic consulting. BCG developed the **Digital Acceleration Index (DAI)** as a comprehensive methodology for assessing the digital maturity of organizations across various industries.

The primary objective of the Digital Acceleration Index is to evaluate an organization's ability to create business value through digital technologies and to benchmark its digital capabilities against industry peers. The methodology enables organizations to identify strengths and weaknesses in their digital transformation initiatives while defining strategic priorities for future development.

Unlike purely technology-oriented assessment models, the DAI evaluates digital transformation as a multidimensional process encompassing business strategy, organizational management, customer experience, digital capabilities, data utilization, and innovation culture.

The assessment is conducted through structured surveys involving both organizational executives and subject-matter experts. Digital maturity is evaluated across **37 assessment criteria**, each measured on a **four-point maturity scale** ranging from Level 1 to Level 4. Individual scores are weighted according to their strategic importance, resulting in an aggregated Digital Acceleration Index that reflects the organization's overall level of digital maturity.

One of the principal advantages of the DAI methodology is its ability to benchmark an organization's digital performance against international best practices while identifying strategic priorities for digital transformation. However, when applied to the banking industry, the model should be expanded to incorporate banking-specific dimensions such as cybersecurity, Open Banking, FinTech integration, artificial intelligence, data-driven decision-making, digital ecosystem development, regulatory technologies (RegTech), and digital risk management. The inclusion of these dimensions would provide a more comprehensive assessment framework for supporting the formulation of innovation

development strategies in commercial banks under conditions of rapid digital transformation.

Currently, the **Boston Consulting Group (BCG)** maintains one of the world's largest digital maturity benchmarking databases, containing assessment results for more than **2,000 companies** across various industries. Owing to its comprehensive evaluation framework, the **Digital Acceleration Index (DAI)** has been adopted not only by private enterprises but also by public institutions and governments to assess the level of digital development and monitor digital transformation initiatives at both organizational and national levels.

The **Digital Acceleration Index** was developed to evaluate an organization's capability to generate business value through digital technologies and to benchmark its digital performance against industry peers. Unlike traditional technology-oriented assessment models, the DAI provides a multidimensional evaluation of digital transformation by integrating strategic, organizational, technological, and innovation-related factors into a unified assessment framework.

The model consists of six major dimensions, each reflecting a critical component of organizational digital maturity.

Table 1. Main Components of the Boston Consulting Group Digital Acceleration Index.

Assessment Dimension	Key Indicators
Digital business strategy	Executive vision for digital transformation; strategic digital ambitions; digital priorities; existence of a digital transformation roadmap
Digitalization of core business activities	Level of digital maturity across core business operations
Growth through digital products and services	Development of new digital products and services; implementation of pilot projects, innovation laboratories, venture initiatives, and business incubators
Transformation of operating model	Digital organizational culture; employee capability development; change management practices
Data and technology capabilities	Big Data management; cybersecurity; Internet of Things (IoT); digital infrastructure
Ecosystem integration	Digital partnerships; ecosystem collaboration; value co-creation through digital platforms

Source: Adapted by the author based on the Boston Consulting Group Digital Acceleration Index methodology.

The DAI assessment is conducted through structured surveys involving senior executives and digital transformation specialists. Organizations are evaluated using **37 assessment criteria**, each measured on a **four-level maturity scale**, ranging from Level 1 (initial maturity) to Level 4 (advanced maturity).

Table 2. Digital Maturity Levels According to the Boston Consulting Group.

Digital maturity level	Characteristics
Digital Starter	Organizations without a clearly defined digital transformation strategy. Digital technologies are implemented only for isolated operational tasks, while most business processes remain largely traditional.
Digital Literate	Organizations that recognize the importance of digital transformation and have developed an initial digital roadmap. However, digital initiatives remain fragmented and are not yet fully integrated across business functions.
Digital Performer	Organizations possessing well-defined digital strategies supported by enterprise-wide implementation of digital initiatives that generate measurable business value and improve competitive performance.
Digital Leader	Organizations in which digital technologies are fully embedded across all business processes. Continuous innovation, ecosystem collaboration, and digital capabilities serve as the primary drivers of sustainable competitive advantage.

Source: Adapted by the author based on the Boston Consulting Group Digital Acceleration Index methodology.

Individual scores are subsequently weighted according to their relative strategic importance, resulting in a composite Digital Acceleration Index that reflects the organization's overall digital maturity. Based on the assessment results, organizations are classified into four distinct digital maturity categories.

The principal advantage of the DAI methodology lies in its ability to benchmark an organization's digital transformation performance against both industry averages and global best practices. Furthermore, the framework assists managers in identifying strengths, weaknesses, and strategic priorities while supporting evidence-based investment decisions in digital transformation.

Despite its comprehensive nature, the DAI methodology has several limitations when applied to the commercial banking sector. The framework was originally designed as a cross-industry assessment tool and therefore does not explicitly incorporate banking-specific dimensions such as **Open Banking**, **FinTech collaboration**, **RegTech**, **SupTech**, **digital financial ecosystems**, **artificial intelligence in financial services**, **digital risk management**, or **regulatory compliance**. Consequently, although the DAI provides a robust foundation for measuring organizational digital maturity, additional banking-specific indicators are required to accurately evaluate the digital readiness of commercial banks.

From the perspective of innovation strategy formulation, the Digital Acceleration Index should therefore be regarded as an important methodological foundation rather than a comprehensive assessment framework. Its integration with banking-specific

strategic indicators would significantly enhance the accuracy of digital maturity assessment and improve the formulation of innovation-oriented development strategies for commercial banks.

KPMG is one of the world's largest professional services networks, providing audit, tax, consulting, and advisory services. Together with **Deloitte**, **PricewaterhouseCoopers (PwC)**, and **Ernst & Young (EY)**, KPMG constitutes the internationally recognized "**Big Four**" accounting and consulting firms. In response to the growing importance of digital transformation, KPMG developed the **Digital Readiness Assessment (DRA)** methodology to evaluate an organization's preparedness for digital transformation and its capability to implement sustainable digital innovation.

Unlike digital maturity models that primarily focus on technological capabilities, the **Digital Readiness Assessment** adopts a holistic approach by evaluating strategic, organizational, operational, technological, and human resource dimensions of digital transformation. The methodology enables organizations to assess their current level of digital readiness, identify capability gaps, evaluate the relevance of existing digital strategies, and formulate practical recommendations for improving transformation performance.

The assessment is conducted through a structured **self-assessment questionnaire** consisting of **67 questions**, grouped into **20 development indicators** across seven key assessment domains. Upon completion of the questionnaire, KPMG recommends conducting facilitated workshops or group interviews to validate the assessment results and develop organization-specific digital transformation initiatives.

Table 3. Main Components of the KPMG Digital Readiness Assessment Framework.

Assessment Dimension	Assessment Category	Key Indicators
Transformation Intensity	Digital Strategy	Digital strategy and objectives; digital leadership; digital transformation roadmap
	Digital Governance	Digital performance management; investment planning and business case development; digital risk management
	Digital Culture	Innovation culture; organizational communication; digital collaboration
Operational Excellence	Digital Customers and Channels	Customer experience; omnichannel management; digital products and services
	Digital Organization and Processes	Organizational agility; business process digitalization; process automation

Technology	Enterprise platforms; cloud
Management	computing; virtualization; data analytics; cybersecurity
Digital Workforce and Capabilities	Human resource strategy; digital skills development; workforce planning

Source: Adapted by the author based on the KPMG Digital Readiness Assessment methodology.

Organizations evaluate each assessment criterion using a percentage scale ranging from **0% to 100%**, with increments of **10 percentage points**. The collected responses are aggregated to calculate the average score for each assessment dimension.

Following data validation, the methodology generates an overall **Digital Readiness Score**, expressed on a maturity scale ranging from **1.0 (Very Low Readiness)** to **5.0 (Very High Readiness)**, with intervals of **0.1 points**. In addition to the overall score, the assessment provides detailed diagnostic results for each evaluation domain, allowing organizations to identify strengths, weaknesses, and priority areas for digital transformation.

One of the major strengths of the KPMG framework is its balanced integration of strategic management, organizational development, technology management, and human capital considerations. Rather than concentrating exclusively on digital technologies, the methodology recognizes that successful digital transformation requires alignment between strategy, governance, organizational culture, operational processes, and workforce capabilities. Consequently, the model supports a comprehensive evaluation of organizational readiness for sustainable digital transformation.

However, despite its comprehensive structure, the Digital Readiness Assessment has several limitations when applied to the commercial banking industry. The methodology is designed as a generic organizational assessment framework and therefore does not explicitly incorporate several banking-specific dimensions, including **Open Banking, embedded finance, digital banking ecosystems, FinTech partnerships, artificial intelligence in banking operations, regulatory technologies (RegTech), supervisory technologies (SupTech), financial cybersecurity, digital financial inclusion, and customer data governance**. Furthermore, the framework places relatively limited emphasis on innovation commercialization and ecosystem-driven value creation, both of which have become increasingly important within modern digital banking strategies.

From the perspective of commercial banks, the KPMG methodology provides a valuable foundation for assessing organizational readiness for digital transformation. Nevertheless, enhancing the framework by integrating banking-specific strategic indicators would substantially improve its applicability for evaluating digital maturity and supporting the formulation of innovation-oriented development strategies. Such an expanded assessment model would enable banks to align digital transformation initiatives more closely with long-term strategic objectives, regulatory requirements, technological innovation, and customer-centric value creation.

The **Digital Transformation Readiness Index** developed jointly by the **NAFI Analytical Center** and the **Skolkovo Foundation** was designed to evaluate the preparedness of Russian enterprises, particularly **small and medium-sized enterprises (SMEs)**, for operating in the digital economy. Unlike traditional digital maturity models that emphasize technological infrastructure, this methodology primarily focuses on an organization's overall readiness to embrace digital transformation through organizational, managerial, technological, and human capital perspectives.

The conceptual foundation of the methodology is based on the **International Digital Economy and Society Index (I-DESI)** developed by the **European Commission**, which is widely applied to assess the digital development of European Union member states. Building upon the I-DESI framework, the NAFI-Skolkovo methodology adapts digital readiness indicators to the enterprise level, thereby providing an integrated instrument for evaluating organizational preparedness for digital transformation.

The assessment methodology was validated using survey data collected from **more than 600 Russian companies**, including both **Skolkovo Innovation Center residents** and enterprises operating across various industries and geographical regions. Organizational representatives completed structured questionnaires designed to measure digital readiness across five strategic dimensions. The collected data were subsequently aggregated to calculate both dimension-specific scores and an overall Digital Transformation Readiness Index.

Table 4. Main Components of the NAFI-Skolkovo Digital Transformation Readiness Index.

Assessment Dimension	Purpose of Assessment
Digital Strategy and Leadership	Evaluates the organization's strategic vision, management commitment, and digital transformation planning.
Digital Infrastructure and Technologies	Assesses the availability and effective utilization of digital technologies, IT infrastructure, and information systems.
Business Processes and Operations	Measures the degree of digitalization, automation, and optimization of operational processes.
Human Capital and Digital Competencies	Evaluates employees' digital skills, organizational learning, and workforce readiness for digital transformation.
Innovation and Digital Culture	Assesses innovation capabilities, openness to change, collaboration, and the development of a digital organizational culture.

Source: Adapted by the author based on the NAFI Analytical Center and Skolkovo Foundation Digital Transformation Readiness methodology.

Unlike benchmarking-oriented assessment models, the NAFI-Skolkovo framework places greater emphasis on identifying organizational barriers that hinder successful digital transformation. Consequently, the methodology enables managers not only to measure current readiness levels but also to determine priority areas requiring organizational improvement before implementing large-scale digital initiatives.

Following the assessment process, individual scores for each evaluation dimension are aggregated to generate an integrated Digital Transformation Readiness Index. This comprehensive indicator reflects the organization's capability to adapt to the rapidly evolving digital economy and to implement innovation-oriented transformation strategies effectively.

Empirical findings reported by the NAFI Analytical Center indicate that digital transformation readiness remains relatively limited among Russian enterprises. According to the **2017 nationwide survey**, approximately **64% of traditional businesses** and **51% of**

Skolkovo resident companies demonstrated insufficient preparedness for comprehensive digital transformation. Among all assessment dimensions, **human capital and digital competencies** exhibited the lowest readiness scores, highlighting the critical importance of workforce development as a prerequisite for successful digital transformation.

The results suggest that technological investments alone are insufficient to ensure sustainable digital transformation. Instead, organizations must simultaneously strengthen leadership capabilities, organizational culture, employee competencies, innovation management, and strategic governance to achieve higher levels of digital maturity.

From the perspective of commercial banking, the NAFI-Skolkovo methodology offers several valuable insights. In particular, its strong emphasis on **human capital development, organizational culture, and change management** aligns closely with the strategic priorities of modern digital banks. However, similar to previously discussed methodologies, it does not explicitly evaluate several banking-specific dimensions, including **digital financial services, Open Banking, FinTech collaboration, artificial intelligence in banking, financial cybersecurity, RegTech, SupTech, customer experience management, and digital financial ecosystems**.

Therefore, although the NAFI-Skolkovo model provides a useful conceptual framework for assessing organizational readiness for digital transformation, its direct application within the banking sector requires the incorporation of additional financial and technological indicators specifically reflecting the characteristics of digital banking.

Overall, the comparative analysis of the **BCG Digital Acceleration Index**, the **KPMG Digital Readiness Assessment**, and the **NAFI-Skolkovo Digital Transformation Readiness Index** demonstrates that each methodology evaluates digital transformation from a different perspective. While BCG primarily emphasizes strategic competitiveness and benchmarking, KPMG focuses on organizational readiness and operational excellence, whereas the NAFI-Skolkovo framework concentrates on organizational preparedness and human capital development. These differences indicate that none of the existing methodologies independently provides a comprehensive assessment framework specifically tailored to the strategic requirements of commercial banks.

Accordingly, this study proposes the development of an **Integrated Bank Digital Maturity Assessment Model (BDMAM)** that combines the strengths of these internationally recognized methodologies while incorporating banking-specific dimensions such as **digital banking strategy, customer-centric innovation, artificial intelligence, financial ecosystem integration, cybersecurity, regulatory compliance, FinTech collaboration, and data-driven decision-making**. Such an integrated framework is expected to provide a more accurate scientific basis for formulating innovation development strategies and enhancing the long-term competitiveness of commercial banks under conditions of digital transformation.

A comparative analysis of the digital maturity assessment methodologies discussed above reveals substantial differences in both their conceptual foundations and assessment dimensions. Although all three approaches seek to evaluate an organization's readiness for digital transformation, they differ considerably in terms of strategic orientation, technological emphasis, organizational focus, and assessment depth.

The comparative evaluation demonstrates that the locally developed **Digital Readiness Index** primarily concentrates on the operational aspects of digital transformation. Its assessment framework focuses predominantly on the digitalization of routine business processes and the implementation of basic digital technologies, while placing relatively limited emphasis on long-term strategic development, innovation management, and organizational transformation. Consequently, the methodology provides a useful diagnostic tool for measuring the current level of digitalization but offers limited support for strategic decision-making and innovation-oriented development planning.

The analysis indicates that the local methodology evaluates digital maturity mainly through three interconnected dimensions:

- Customer interaction and digital customer relationship management;
- Organizational governance and digital management practices;
- Data management and the utilization of digital information resources.

Within the **customer interaction** dimension, organizations demonstrating effective use of customer relationship management (CRM) systems, data-driven marketing strategies, digital communication channels, and automated customer services are considered to possess higher levels of digital maturity.

The **organizational governance** dimension assesses the extent to which digital transformation is embedded within senior management responsibilities, strategic planning processes, and business process optimization initiatives.

The **data management** dimension evaluates the organization's capability to collect, store, integrate, and utilize digital data for managerial decision-making and business process improvement.

Although these dimensions represent fundamental components of digital transformation, they do not fully capture the multidimensional nature of digital maturity required for sustainable innovation-driven development.

By contrast, the **BCG Digital Acceleration Index** and the **KPMG Digital Readiness Assessment** adopt substantially broader evaluation frameworks that integrate strategic, organizational, technological, and human resource perspectives. Their methodologies extend beyond operational digitalization by incorporating several additional dimensions that significantly enhance the comprehensiveness of digital maturity assessment.

First, both methodologies emphasize the importance of **digital strategy**, evaluating the existence of measurable digital transformation objectives, strategic roadmaps, investment priorities, and executive commitment to digital innovation.

Second, considerable attention is devoted to **organizational culture**, where digital leadership, innovation culture, employee engagement, and organizational openness to technological change are regarded as critical determinants of successful digital transformation.

Third, **human capital development** represents another major assessment dimension. Both methodologies examine employee digital competencies, continuous professional development, analytical capabilities, and the adoption of Agile management practices aimed at increasing organizational flexibility, accelerating decision-making, and improving cross-functional collaboration.

Furthermore, these methodologies evaluate the level of **technological capability**, including the adoption of artificial intelligence, big data analytics, cloud computing, cybersecurity solutions, enterprise digital platforms, and integrated information systems capable of supporting real-time business operations.

Additional assessment dimensions include **business process digitalization**, **business model innovation**, **digital products and services**, **digital infrastructure**, and **information security management**. Collectively, these components provide a comprehensive evaluation of an organization's ability to create sustainable competitive advantages through digital transformation.

Table 5. Comparative Assessment Dimensions of Digital Maturity Methodologies.

Assessment Dimension	Local Digital Readiness Index	BCG DAI	KPMG Digital Readiness
Digital Strategy	Limited	✓	✓

Leadership & Governance	Partial	✓	✓
Customer Relationship Management	✓	✓	✓
Data Management	✓	✓	✓
Corporate Culture	Limited	✓	✓
Human Capital Development	Limited	✓	✓
Business Process Digitalization	✓	✓	✓
Artificial Intelligence & Big Data	Limited	✓	✓
Digital Infrastructure	Limited	✓	✓
Cybersecurity	Partial	✓	✓
Digital Business Models	No	✓	Partial
Digital Products & Services	Partial	✓	✓
Innovation Ecosystems	No	✓	Partial

Source: Compiled by the author based on BCG, KPMG, and NAFI–Skolkovo methodologies.

The comparative analysis clearly demonstrates that existing methodologies provide valuable but incomplete approaches to assessing digital maturity. While the local framework effectively evaluates operational digitalization, it pays relatively little attention to strategic management, innovation capability, organizational adaptability, and ecosystem integration. Conversely, the BCG and KPMG methodologies offer more comprehensive assessment frameworks; however, neither has been specifically designed to address the distinctive characteristics of commercial banking institutions.

Commercial banks operate within a highly regulated, technology-intensive, and customer-centric environment, requiring additional assessment dimensions such as **Open Banking, FinTech collaboration, digital financial ecosystems, artificial intelligence in financial services, RegTech, SupTech, data-driven decision-making, cyber resilience, and digital financial inclusion**. These critical dimensions are either partially represented or entirely absent in existing assessment models.

Therefore, the findings of this comparative analysis provide a strong scientific justification for developing an **Integrated Bank Digital Maturity Assessment Model (BDMAM)**. Unlike existing methodologies, the proposed framework incorporates technological, organizational, strategic, innovation, ecosystem, regulatory, and customer-centric dimensions into a unified assessment model specifically tailored to support the formulation of innovation development strategies for commercial banks under conditions of digital transformation. This integrated approach constitutes the principal scientific contribution of the present research and forms the methodological foundation for the model proposed in the subsequent section.

An assessment of the digital maturity of commercial banks in Uzbekistan was conducted using the **Deloitte Digital Maturity Model** as the methodological framework. The analysis focused on systemically important commercial banks that account for a significant share of the country's banking assets and financial services. The assessment covered the five core dimensions of Deloitte's digital maturity framework, namely **Customer, Strategy, Technology, Operations, and Organization**, in order to evaluate the current state of digital transformation within the banking sector.

The assessment results indicate that the highest levels of digital maturity have been achieved in the **Customer** and **Technology** dimensions. Over recent years, commercial banks have substantially expanded mobile and internet banking services, introduced

omnichannel customer interaction platforms, enhanced customer relationship management (CRM) systems, and modernized digital payment infrastructure. Continuous investment in information technologies, cloud computing, application programming interfaces (APIs), and real-time payment systems has significantly strengthened the technological capabilities of the banking sector.

The **Strategy** dimension demonstrates a relatively high level of development. Most commercial banks have incorporated digital transformation into their long-term development strategies and have begun implementing innovation-oriented projects aimed at improving operational efficiency and customer experience. Nevertheless, differences remain in the pace and effectiveness of strategy implementation across individual banks.

The **Operations** dimension exhibits a moderate level of digital maturity. Although many operational processes have been automated and digitized, several banking activities continue to rely on partially manual procedures, limiting overall operational efficiency. Further process integration and end-to-end digitalization remain important priorities for achieving higher levels of organizational performance.

The assessment identifies the **Organization** dimension as the least developed component of digital maturity within Uzbekistan's commercial banking sector. Existing organizational structures, management practices, and corporate culture have not yet fully adapted to the requirements of digital transformation. In particular, the adoption of **data-driven decision-making**, agile management approaches, innovation-oriented corporate culture, and systematic digital competency development among employees remains relatively limited. These organizational constraints continue to represent the primary barriers to achieving comprehensive digital transformation.

Overall, the findings suggest that Uzbekistan's commercial banks have established a solid technological foundation for digital transformation; however, sustainable progress increasingly depends on strengthening organizational capabilities rather than solely expanding technological infrastructure. Future innovation development strategies should therefore place greater emphasis on digital leadership, organizational change management, employee upskilling, corporate innovation culture, and integrated digital governance mechanisms.

Consequently, improving the **organizational dimension** of digital maturity should become a strategic priority for commercial banks seeking to enhance their competitiveness, accelerate innovation adoption, and successfully implement comprehensive digital transformation initiatives. These findings further support the necessity of developing a **bank-specific digital maturity assessment model** that incorporates not only technological readiness but also strategic management, organizational adaptability, human capital development, innovation capability, cybersecurity, and ecosystem integration as essential determinants of long-term digital competitiveness.

4. Conclusions and Recommendations

This study examined the theoretical and methodological foundations of digital maturity assessment and evaluated the applicability of internationally recognized digital maturity models for supporting innovation development strategies in commercial banks. A comparative analysis of the **BCG Digital Acceleration Index**, **KPMG Digital Readiness Assessment**, **NAFI-Skolovo Digital Readiness Index**, and the **Deloitte Digital Maturity Model** demonstrates that each methodology captures important aspects of digital transformation; however, none of them provides a comprehensive framework specifically tailored to the operational characteristics and strategic priorities of commercial banks.

The findings indicate that digital maturity should be interpreted not merely as the level of technological adoption but as a multidimensional organizational capability

integrating strategic management, digital governance, innovation management, customer-centricity, organizational culture, human capital, cybersecurity, data analytics, and ecosystem collaboration. Consequently, assessing digital maturity solely through technological indicators is insufficient for evaluating the innovation potential and long-term competitiveness of banking institutions.

The empirical assessment conducted using the Deloitte Digital Maturity Model reveals that commercial banks in Uzbekistan have achieved relatively high levels of maturity in the **Customer**, **Technology**, and **Strategy** dimensions. Considerable progress has been observed in the development of digital payment systems, remote banking services, mobile applications, cloud technologies, and customer relationship management. Nevertheless, the **Organization** dimension remains the weakest component of digital maturity. Limited implementation of data-driven management, insufficient digital leadership, underdeveloped innovation culture, fragmented change management practices, and inadequate employee digital competencies continue to constrain the effectiveness of digital transformation initiatives.

The comparative analysis further demonstrates that existing international methodologies insufficiently address several banking-specific factors, including **Open Banking**, **FinTech collaboration**, **artificial intelligence applications**, **digital financial ecosystems**, **RegTech**, **SupTech**, **cyber resilience**, and **digital financial inclusion**. These dimensions have become critical determinants of competitiveness within the contemporary banking industry and therefore require explicit consideration in digital maturity assessment frameworks.

Based on these findings, the study proposes the development of an **Integrated Bank Digital Maturity Assessment Model (BDMAM)** that combines the strengths of internationally recognized methodologies while incorporating banking-specific strategic, technological, organizational, regulatory, and innovation dimensions. The proposed framework provides a more comprehensive scientific basis for measuring digital maturity and supporting evidence-based innovation strategy formulation in commercial banks.

From a practical perspective, several recommendations are proposed. First, commercial banks should institutionalize digital governance systems by embedding data-driven decision-making into strategic management processes. Second, investments should increasingly focus on organizational transformation, leadership development, and continuous enhancement of employees' digital competencies alongside technological modernization. Third, banks should strengthen collaboration with FinTech companies, technology providers, universities, and innovation ecosystems to accelerate knowledge transfer and technological innovation. Fourth, integrated performance measurement systems based on digital maturity indicators should be incorporated into strategic planning, enabling continuous monitoring and evaluation of transformation outcomes.

Overall, the proposed methodological approach contributes to the existing literature by extending conventional digital maturity assessment beyond technology-oriented evaluation toward a comprehensive banking-specific framework. The implementation of the proposed model is expected to improve strategic decision-making, enhance innovation capacity, strengthen digital competitiveness, and support the sustainable development of commercial banks under conditions of accelerating digital transformation.

The principal scientific contribution of this research lies in the development of a comprehensive methodological framework for assessing digital maturity that is specifically designed for commercial banks. Unlike existing international models, the proposed framework integrates strategic management, organizational capability, technological readiness, innovation performance, digital ecosystems, cybersecurity, customer-centricity, and regulatory compliance into a unified assessment system. This integrated approach provides a scientifically grounded instrument for selecting

innovation development strategies and enhancing the long-term competitiveness of commercial banks in the digital economy.

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