



Four-Dimensional Evolution of the Industrial and Commercial Bank of China from Digitalization to Digital Intelligence

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Abstract. Against the backdrop of profound empowerment of the financial industry by the digital economy and artificial intelligence (AI) technology, the transformation of state-owned banks has entered a new phase of digitalization and intelligentization. This article examines the Industrial and Commercial Bank of China (ICBC) as the research subject. Drawing on the single-case longitudinal research design, and integrating McKinsey's 3+1 framework and Sia-Weill-Zhang future-ready enterprise framework, the paper constructs a four-dimensional analytic framework encompassing strategy, technology, business, organization, and talent, and systematically analyze ICBC's transformation trajectory from Digital-ICBC to AI-ICBC. The study finds that ICBC's digital transformation exhibits a clear shift from "scene connectivity" to AI-driven operations, from distributed architecture to ICBC Zhiyong Large Model System, from online channel migration to comprehensive scene-based digital and intelligent reconstruction, and from technology-business integration to AI-driven deep business transformation. The findings offer theoretical and practical implications for the digital transformation of other state-owned commercial banks.

Keywords: Digital Transformation, ICBC, AI-ICBC, McKinsey's 3+1 framework.

1 Introduction

With the deep integration of digital technologies into the financial sector, competitive pressure among peer institutions has intensified. Rapid advances in artificial intelligence (AI), big data analytics, cloud computing, and blockchain are propelling commercial banks into a new stage of digitalization [1]. In China, policy initiatives, including national fintech development plans and the "AI+" Action Plan, further guide financial institutions to enhance service quality and efficiency through technological innovation and to support the real economy [2]. As core providers of services to the real economy and of inclusive finance, state-owned commercial banks typically operate at large scale and bear significant public responsibilities; their transformation practices therefore have important benchmarking value for the industry. As one of the largest

state-owned banks by global asset size, the full cycle transformation of the Industrial and Commercial Bank of China (ICBC) is a paradigmatic case of systematic institutional change [3]. Studying this case has both theoretical significance and practical necessity.

Existing research on bank digital transformation has progressed through three phases, including technical perspectives, multidimensional quantification, and case-based exploration, producing substantial insights. Nevertheless, notable gaps remain. Most studies rely on industry-wide panel data or comparative case analyses, lacking in-depth longitudinal tracking of a single representative bank. There is also a shortage of systematic articulation of the stagewise evolution from “digitalization” to “digital intelligence”, and no stage analysis framework tailored to the transformation practices of state-owned banks has been fully developed. These limitations hinder explanation of the evolutionary pathways for strategy, technology, business, organization, and talent during the transformation process. To address these gaps, this article investigates ICBC’s digital transformation practice from 2020 to 2025. Building on McKinsey’s 3+1 framework [4] and Sia-Weill-Zhang future-ready enterprise framework [5], the paper develops a four-dimensional stage analysis framework to answer two research questions. First, what stages has ICBC traversed during its digital transformation and what are the core implementation pathways and supporting logics? Second, what substantive achievements have been realized, what risks remain, and what lessons can be drawn for similar institutions?

The study makes three principal contributions. First, it provides a full cycle longitudinal account of ICBC’s transformation from 2020 to 2025, delivering an updated and in-depth case study. Second, it proposes a stage analysis framework of digital intelligence suited to state-owned banks, thereby extending the applicability of established transformation theories. Third, it expands the analytical scope by examining the coordinated evolution mechanisms among four dimensions, namely strategic leadership, technical support, business implementation, and organizational and talent assurance in ICBC’s digital transformation.

2 Theoretical Basis and Literature Review

2.1 Research Context of Bank Digital Transformation

The scholarly trajectory on bank digital transformation has progressed from a singular technical perspective to a multidimensional framework and subsequently to in-depth case studies. This evolution can be broadly categorized into three stages. The earliest studies concentrated on technological change, treating information technology (IT) construction as the central lens and equating digital transformation with upgrades to bank information systems. In this view, digital transformation was largely the electronic reengineering of traditional business processes through technological means, representing an application of technology that did not yet penetrate the deeper business logic of banking or address new business and management models. Drawing on the resource-based view, Bharadwaj (2000) was among the first to identify IT capability as a core source of firm level competitive advantage, thereby providing a theoretical basis for

early work on technology driven firm transformation [6]. Earlier empirical work by Banker et al. (2008) examined the effects of IT investment on cost structures and operational efficiency in the banking industry and evidenced preliminary gains from technology adoption [7]. Xie & Zou (2013) systematically analyzed how IT enables the electronic transformation of legacy financial processes and clarified the tool like attributes of early digital efforts [8]. Although this first stage is dominated by a narrow technological focus, it established an important foundation for subsequent research on technology application in banking.

The middle period of research transcended a purely technical viewpoint and moved toward integrated analyses that incorporated strategy, business processes, and management, giving rise to quantitative measurement systems. Researchers increasingly employed large sample panel data to model relationships, perform regression analyses, and test the effects of digital transformation on bank performance and market competitiveness. Wu et al. (2015) proposed a multidimensional digital maturity model derived from global banking data, encompassing technology adoption, process reengineering, and organizational change, which offered an initial framework for quantifying banks' digitalization levels [9]. Xie & Wang (2023) refined measurement approaches by constructing a comprehensive index across strategy, business, and management dimensions and demonstrated the role of digital transformation in enhancing bank operational efficiency [10]. They quantitatively assessed 221 commercial banks from 2010 to 2018, addressing limitations of manufacturing-based indicator systems. While this middle phase broadened analytic dimensions and provided quantitative tools, many studies used industry level samples and thus offered limited heterogeneity analysis for different bank types, particularly for large state-owned banks, constraining practical guidance.

In the most recent stage, case-based studies have become more prominent, and scholarship has shifted toward articulating concrete transformation pathways, core capability building, and key determinants with increasing granularity. Shen & An (2025), drawing on digital ecosystem theory, pointed out that the digital transformation of commercial banks should center on the construction of platform ecosystem core elements and the development of multi-actor value co-creation mechanisms [11]. Through a three-stage pathway comprising resource integration and sharing, interactive innovation, and network synergy, banks could transition from traditional financial service providers to digital ecosystem enablers, effectively addressing challenges such as insufficient data sharing, imperfect credit mechanisms, and inadequate financial service adaptability in industrial chain coordination. Zhang et al. (2024) suggested that commercial banks should advance their transformation around a five-dimensional framework encompassing digital ecosystem, digital assets, digital technology, digital infrastructure, and digital genes [12]. Through the Government-Business-Consumer (GBC) strategy, they can build a digital community ecosystem that deeply integrates finance with digital government, digital industry, and digital livelihood. Xiang & Gao (2023), from the perspective of bank liquidity hoarding, demonstrated that digital transformation played a critical role in reshaping bank business models and risk control systems by optimizing credit allocation efficiency and risk identification capabilities [13].

2.2 Theoretical Framework

Existing scholarship on bank digital transformation frequently draws theoretical frameworks from industry practice and cross-border banking cases. Two influential models, i.e., McKinsey’s 3+1 framework and Sia-Weill-Zhang future-ready enterprise framework, serve as primary references for the analytical framework developed in this study.

McKinsey’s 3+1 Framework. In the Winter 2018 issue of McKinsey China Banking CEO Quarterly, McKinsey introduced the 3+1 framework for bank digital transformation [4]. The framework comprises three strategic pillars and a set of foundational capabilities. The three pillars correspond to principal directions for digital transformation in banking: business model innovation, which employs technology to reconfigure value creation; end-to-end digitalization of core businesses, which centers on customers and pursues full online automation to reduce costs, improve efficiency, enhance customer experience, and strengthen risk management; and fintech and ecosystem deployment, which entails strategic investment, partnerships, and internally developed financial technology capabilities. Underpinning these pillars is a set of basic capabilities that focus on data governance, technical architecture, and agile organization, which together provide the enabling infrastructure for transformation.

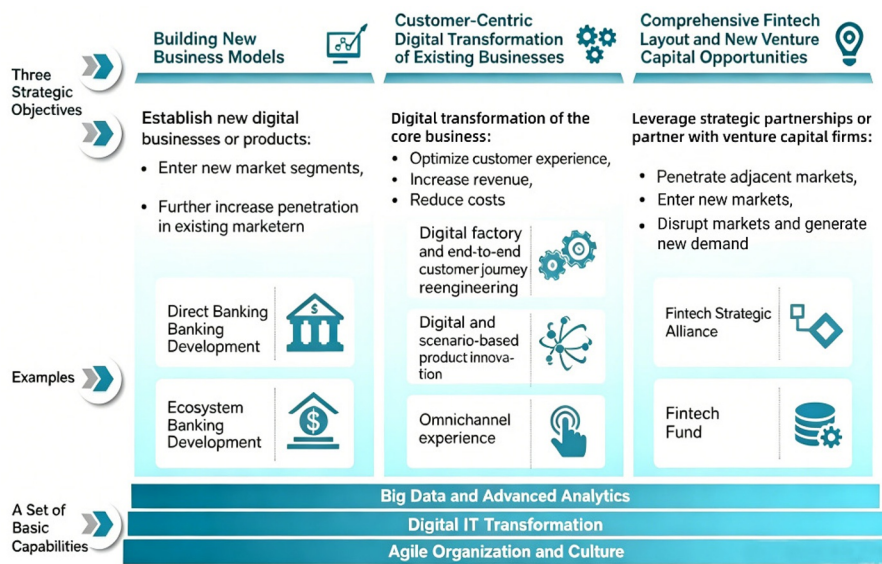


Fig. 1. McKinsey’s 3+1 framework.

As shown in Figure 1, the McKinsey’s 3+1 framework is well aligned with banking business scenarios and offers strong practical guidance by addressing customer service, risk management, process efficiency, and product innovation. Its multidimensional perspective permits integration of strategy, technology, business, risk control, and organizational issues and facilitates synthesis with other theoretical approaches. Nevertheless,

the framework has limitations. Originating in consulting practice, it lacks formal academic development, offers limited theoretical exposition of interaction mechanisms among modules during transformation, and does not explicitly capture the dynamic, phased evolution characteristic of long-term transformations in large state-owned banks.

Sia-Weill-Zhang Future-Ready Enterprise Framework. Drawing upon Sia, Weill, and Zhang's (2021) research on DBS Bank's future-ready enterprise transformation, this study distills an analytical framework for bank digital transformation from their two core constructs, organizational ambidexterity (the balance between exploitation and exploration) and business-technology fusion (the integration of IT and business operations from separation to embedding to symbiosis) [5]. The framework comprises two dimensions. The vertical axis captures organizational ambidexterity (the degree of balance between exploitation and exploration), while the horizontal axis captures the IT-business fusion level (ranging from separation to embedding to symbiosis). Based on these two dimensions, the transformation process can be categorized into three stages, namely IT-business alignment, dual-capability organization building, and business capability platform reconfiguration. This inductively derived framework offers a dynamic, evolutionary analytical lens for this study; however, its grounding in a single-case context (Singapore) necessitates careful validation when applied to the institutional environment of Chinese state-owned megabanks.

The model contributes a dynamic, stage-based perspective that addresses limitations of static frameworks and is adaptable to long term, phased transformation processes. However, because it is grounded in a single case from Singapore, its applicability to Chinese state-owned banks, whose policy, market, and regulatory environments differ substantially, requires empirical validation and contextual adjustment.

Although the McKinsey's and Sia-Weill-Zhang frameworks each offer valuable insights, existing literature exhibits two principal shortcomings. First, much empirical work relies on industry wide panel data or comparative case studies and therefore lacks deep longitudinal tracking of single, representative banks. Second, there is an absence of a systematic stagewise account of the progression from digitalization to digital intelligence, and no stage analysis framework tailored to the transformation practice of state-owned banks has been fully established. These gaps motivate the analytical approach adopted in this study.

3 Methodology

3.1 Research Design

This study employs a single-case longitudinal research design, with the ICBC as the focal case, and examines the practical processes and evolutionary characteristics of its full digital transformation cycle from 2020 to 2025. From the perspective of case selection rationale, ICBC, as a leading state-owned commercial bank by global asset size,

possesses a substantial technological foundation and capacity to enhance capital efficiency. ICBC initiated its digital transformation early, articulated a clear strategy, improved governance and promotion mechanisms, and demonstrated strong execution capabilities. These attributes confer representativeness on ICBC's transformation practice, rendering it an instructive case for other state-owned and commercial banks seeking pathways to digitalization and technology-enabled value creation. From the perspective of longitudinal research value, the period 2020 to 2025 represents a critical phase of rapid iteration in banking digital infrastructure and a core interval for the deepening of ICBC's digital intelligence strategy. Continuous observation over this interval mitigates the limitations of static cross-sectional analysis and permits clear identification of phased changes in strategic orientation, technological architecture, business implementation, and development priorities, thereby exposing the evolutionary regularities and internal logic of digital transformation.

From the perspective of research question fit, this study addresses how large commercial banks implement, iterate, and optimize digital transformation. Compared with variable-centered quantitative approaches, case study method offers richer, processual insights into complex and dynamic strategic practices, aligning with the objectives of this research.

3.2 Data Sources: Triangulation of Multiple Secondary Data

To ensure credibility and rigor, this study triangulates multiple secondary data sources drawn from distinct channels and modalities to reduce bias arising from any single source. The data fall into three main categories.

First, official disclosures by the bank, including ICBC's 2020-2025 annual reports, interim results announcements, social responsibility reports, investor relations materials, environmental, social, and governance (ESG) reports, and governance disclosures. These authoritative documents capture ICBC's strategic positioning on digital intelligence, enterprise-wide deployment, and major project developments and constitute the primary evidentiary base. Second, dynamic business process materials, comprising transcripts of ICBC's 2020-2025 earnings conferences, investor presentations, and public interviews with senior management. These sources supply procedural detail and contemporaneous managerial intent that are not fully reflected in formal reports, improving the timeliness and completeness of the study. Third, industry and third-party sources, including in-depth coverage by financial media such as Sina Finance, Beijing Business Daily, and China Financial News, and evaluation reports issued by professional firms and research institutions such as *KPMG*, *Ernst & Young*, and *iResearch Consulting*. These external perspectives provide industry context and independent assessments that help mitigate single-actor bias.

3.3 Analytical Methods: Thematic Coding and Stage Comparative Analysis

This study applies a mixed analytical approach that combines thematic coding [14] with longitudinal stage comparative analysis. First, building on a preconstructed four-dimen-

sional analytic framework of strategy, technology, business, and organization and talent, the paper conducts open coding and axial coding at the sentence and paragraph levels on secondary materials such as ICBC's annual reports, earnings conference documents, and authoritative industry reports from 2020 to 2025. Fragmented textual units are systematically categorized into the four core dimensions to produce a standardized coding schema and to ensure consistency and rigor in the analytical process.

Second, leveraging the time-series character of the single-case design and key inflection points in ICBC's transformation, the 2020-2025 period is divided into two principal stages, Digitalization 1.0 and Intelligent Digitalization 2.0 [15]. Through cross-stage horizontal comparison, the analysis identifies core differences in strategic positioning, technology investment, business models, and organizational arrangements, extracts the evolutionary logic and characteristic features of ICBC's digital transformation, and evaluates transformation outcomes to address the central research questions of this study.

4 Findings

This study conducts a comparative analysis of ICBC's digital intelligence transformation along four dimensions, including strategic positioning, technological infrastructure, business transformation, and organizational and talent change. The analytical framework is grounded in both theory and practice. First, it draws on the authoritative domestic three-dimensional model of strategy, business, and management proposed by the Financial Research Center at Peking University as its core theoretical foundation. Second, it engages in a dialog between local theory and international practice by integrating McKinsey's 3+1 transformation framework and DBS Bank's IT and business integration framework. Third, motivated by ICBC's evolution from a digitally enabled bank to a digitally intelligent bank, the technological element is disaggregated from the original business and management dimensions to form a four-dimensional analytic schema. Using this framework, the study systematically traces ICBC's evolution from Digital-ICBC (D-ICBC) 1.0 (digitalization stage) to AI-ICBC 2.0 (digital intelligence stage), revealing the core logic and key breakthroughs underlying the transition from connectivity to intelligence and from digitalization to digital intelligence.

4.1 Strategic Transformation: Top-level Design Upgrade from Connectivity to Intelligence

With the rapid advancement of AI and the emergence of relevant national strategies, ICBC's strategic trajectory has evolved clearly from a scenario connectivity oriented digital bank to an AI-driven intelligent bank. The core differences between D-ICBC 1.0 and AI-ICBC 2.0 are summarized in Table 1 [16].

Table 1. Comparison of strategic dimensions between D-ICBC 1.0 and AI-ICBC 2.0.

Dimension	D-ICBC 1.0	AI-ICBC 2.0
Strategic positioning	Centered on GBC linkage to integrate service scenarios and construct an online, scenario-based financial service system. The primary aim was to address service reach and accessibility by migrating offline services online and extending service from branch centric to integrated online and offline delivery.	ICBC launched the “AI+” Action Plan, shifting strategic focus from scenario connectivity to AI empowerment. The objective is to embed AI across end-to-end processes to move from reactive responses to proactive prediction and intelligent decision making. The strategic priority shifts from expanding coverage to creating new value and better meeting customer needs.
Deployment framework	ICBC established a five-dimensional layout comprising digital ecosystem, digital assets, digital technology, digital infrastructure, and digital culture, focused on building foundational capabilities, digital infrastructure, digital asset systems and an online service ecosystem.	ICBC proposed a new framework emphasizing new productivity driven development plus high security, high reliability, and high efficiency, and four core directions: intelligent business, smart services, computing intelligence, and intelligent customer experience to achieve comprehensive upgrades.
Policy basis	Anchored in the Fintech Development Plan for 2019-2021, responding to early national directives for digitizing the financial sector and achieving initial integration of financial technology and business scenarios to complete the basic digital transformation.	Aligned with ICBC’s 2025 strategic plan and national initiatives for AI and Digital China construction. The advanced strategy responds to matured AI technologies and intensified competition, aiming to serve new productivity and consolidate the leading position of a state-owned large bank.

From the perspective of strategic logic, the core of the D-ICBC phase is “connectivity”, which essentially addresses the accessibility issue of whether financial services “exist or not”; whereas the core of the AI-ICBC phase is “intelligence”, which fundamentally tackles the quality issue of whether financial services are “good or not”, thereby completing the strategic leap from digitization to intelligentization.

4.2 Technological Transformation: Capability Leap from Distributed Architecture to a Foundation Model Hub

The technological foundation is the core support for ICBC digital intelligence transformation. From D-ICBC to AI-ICBC, the technical architecture and key technologies have been upgraded comprehensively from basic support to an intelligent hub. The principal differences are summarized in Table 2 [17].

Table 2. Comparison of technical foundations between D-ICBC 1.0 and AI-ICBC 2.0.

Dimension	D-ICBC 1.0	AI-ICBC 2.0
Technical base	Smart Banking Ecosystem (ECOS) 1.0, focused on building basic digital technology capabilities to support online business.	ECOS 2.0, a full stack technological foundation reconstructed around AI foundation models to support digital intelligence capabilities.
Core architecture	Cloud computing plus distributed architecture to address post-migration computing capacity, system stability, and scalability for high concurrency.	ICBC Zhiyong foundation model, a three-tier foundation model system comprising general foundation models, industry foundation models, and scenario foundation models, serving as the technical hub for enterprise-wide digital intelligence transformation.
Key technologies	Initial application of big data, AI, and blockchain, emphasizing data collection, basic analytics, and simple scenario implementation.	Blockchain upgraded to the “ICBC Xi Chain” platform to enable end-to-end trusted traceability in supply chain finance; deep integration of AI and machine learning to drive intelligent risk control, intelligent marketing, and intelligent operations across scenarios.

The ICBC Zhiyong foundation model has become the core of the technological base. Its value manifests at two levels. First, business scenario empowerment: through foundation model capabilities such as natural language understanding, multimodal generation, and logical reasoning, ICBC achieves end-to-end automation in scenarios including robo-advisory, intelligent customer service, automated risk reporting, and intelligent credit approval, thereby substantially improving processing efficiency. Second, architectural reconstruction: the foundation model accelerates the transition from distributed business systems to an integrated cloud, AI, and big data architecture, enabling elastic allocation of computing resources, rapid reuse of technical capabilities, and agile response to scenario innovation.

Blockchain technology has deepened from technical piloting to scenario implementation in the AI-ICBC stage. Key applications include comprehensive supply chain finance risk control, where immutable transaction, logistics, and payment records on the blockchain provide trustworthy data for penetrating trade authenticity verification and reducing false trade risk; and multi-tier supplier financing, where on-chain certificates of the core enterprise’s credit can be transmitted to upstream and downstream suppliers, allowing upstream suppliers to obtain financing quickly based on chain records and alleviating financing constraints for small and micro enterprises at the ends of the supply chain.

4.3 Business Transformation: Scene Implementation from Online Migration to Digital-Intelligence Reconstruction

ICBC ultimately realizes digital transformation through upgrades to business scenarios. The D-ICBC stage emphasized online migration of business, whereas the AI-ICBC stage implements comprehensive digital-intelligence reconstruction. The upgrade paths of major business units are summarized in Table 3 [18].

Table 3. Comparison of business units between D-ICBC 1.0 and AI-ICBC 2.0.

Dimension	D-ICBC 1.0	AI-ICBC 2.0
Retail banking	Online migration of personal banking and pension services, enabling online account management, transfers and remittances, and pension inquiries; Mobile Banking version 10.0 with HarmonyOS native support integrated voice, card widgets, microservices, and distributed collaboration to provide a faster, safer, and more intelligent omnichannel mobile banking experience.	Pension services upgraded with AI algorithms to enable intelligent pension account projection, asset allocation recommendations, and retirement planning services; AI wealth management (robo-advisory) generates personalized investment portfolios based on customer risk preferences, asset status, and market conditions.
Corporate banking	Launched ICBC e-Enterprise Payment and upgraded the ICBC Ju Platform, enabling the digitalization of basic corporate banking services such as enterprise account management, online payment, etc., thereby providing enterprises with comprehensive online corporate settlement services characterized by “fund security, process convenience, and risk controllability”.	Application programming interface open banking embeds financial services into enterprise production and operation scenarios to deliver account services, payment and settlement, and financing as scenario outputs; industrial digital finance provides end-to-end digital financial services around core industry chain activities, such as online supply chain financing, bill discounting, and cash management.
Inclusive finance	Introduced online inclusive loan products to realize online application, approval, and disbursement processes, thereby improving processing efficiency for inclusive lending.	Large foundation models perform multidimensional deep analysis of enterprise operating data and tax information to construct more accurate risk models and enable automated loan approval, automatic limit estimation, and real-time risk alerts, expanding coverage and efficiency.
Financial markets	Custody services digitalized around a proprietary smart custody system driven by big data to achieve end-to-end process digitalization, comprehensive risk control, global integration, and an open ecosystem.	Intelligent asset management uses AI algorithms for intelligent portfolio rebalancing, real-time market risk monitoring, and dynamic optimization of investment strategies to raise asset management intelligence.

The comparison in Table 3 reveals an intergenerational upgrade logic in ICBC’s business transformation. The transformation focus has shifted from channel migration to value reshaping, with the D-ICBC stage concentrating on migrating offline services online to remove access barriers and achieve broad online coverage for retail, corporate, inclusive, and market services, whereas the AI-ICBC stage reconstructs end-to-end business processes using AI algorithms to transition from customers seeking services to services proactively locating customers, achieving precise identification and personalized delivery and thereby improving service quality. The transformation value has progressed from efficiency improvement to ecosystem co-creation, with the D-ICBC stage delivering basic online processing services and the AI-ICBC stage embedding financial services throughout real economy production and operation processes via foundation model analytics, application programming interface open banking, and industrial digital finance, thereby enabling collaborative industry ecosystem development.

4.4 Organizational and Talent Transformation: Mechanism Change from Technology-Business Integration to AI-Driven Business Reshaping

The implementation of ICBC digital intelligence transformation depends on complementary upgrades in organizational structure, talent pipelines, and institutional culture. ICBC has advanced from technology integrated with business to business deeply shaped by AI. The principal differences are summarized in Table 4.

Table 4. Comparison of organizational and talent dimensions between D-ICBC 1.0 and AI-ICBC 2.0.

Dimension	D-ICBC 1.0	AI-ICBC 2.0
Organizational structure	Integration of technology and business units, establishment of a fintech subsidiary and cross-departmental digital project teams to remove the barrier of technology as a back-office function.	Formation of scenario-centric agile teams that break down departmental silos and realize the integration of business and technology.
Talent pipeline	Emphasis on developing hybrid talents with both financial and technical expertise.	Establishment of targeted incentive mechanisms for technology personnel and intensified recruitment in AI and big data; organization-wide enhancement of AI application capabilities through training and project practice.
Institutional culture	Advancement of data governance with the establishment of data standards and data quality control systems.	The entire bank adopts the ethos of evidence-based decision making, using data for analysis, decision making, and management across processes.

ICBC's organizational and talent transformation therefore reflects an evolution from technology-business integration to AI-deeply-shaped business. Organizational structures have evolved from integrated technology and business departments to scenario-based AI driven agile teams; talent development has progressed from cultivating hybrid financial-technology personnel to creating targeted AI talent pipelines while expanding AI capabilities across staff; and institutional culture has progressed from foundational data governance to an enterprise-wide data driven decision culture, thereby providing fundamental assurance for the bank's digital intelligence transformation.

5 Discussion & Conclusion

This study employs a longitudinal single-case design focusing on ICBC to synthesize its full-cycle transformation from D-ICBC to AI-ICBC across 2020-2025. The principal findings can be organized into four interrelated dimensions that document a systematic intergenerational upgrade.

At the level of strategic orientation, ICBC has completed a strategic transition from scenario connectivity to AI driven operations. In the D-ICBC 1.0 stage, linkage among government, business, and consumers was used primarily to address outreach and accessibility constraints of financial services. In the AI-ICBC 2.0 stage, the "AI+" Action Plan promoted deep embedding of artificial intelligence across end-to-end processes, shifting strategic emphasis from expanding coverage to creating new sources of value through proactive prediction and intelligent decision making. With respect to the technological foundation, ICBC achieved a capability leap from a cloud computing and distributed architecture to a foundation model hub, which is ICBC Zhiyong, comprising a three-tier system of general foundation models, industry foundation models, and scenario foundation models. This technical evolution transformed the technology stack from basic digital support into an integrated cloud, AI, and big data architecture that enables elastic compute allocation, rapid reuse of capabilities, and agile scenario innovation. In terms of business model evolution, the bank advanced from online migration to comprehensive digital-intelligence reconstruction. Retail, corporate, inclusive finance, and financial markets businesses moved from basic online service provision to deep AI enabled capabilities, such as automated credit decisioning, precision risk control, robo-advisory, application programming interface open banking, and industrial digital finance. This shift represents a role change from a traditional fund intermediary to a comprehensive financial ecosystem service provider. Concerning organizational and talent arrangements, ICBC's mechanisms evolved from technology and business integration to AI driven business shaping. Organizational structures moved from integrated technology and business departments to scenario-centric agile teams; talent development progressed from cultivating hybrid financial-technology professionals to building targeted AI talent pipelines combined with bank-wide capability enhancement; and institutional culture advanced from foundational data governance to an enterprise-wide data driven decision culture. Together, these four dimensions constitute ICBC's end-to-end pathway from digitalization to digital intelligence.

This empirical case both corroborates and extends two prominent theoretical frameworks. First, ICBC's practice largely confirms the applicability of the McKinsey's 3+1 framework in the context of Chinese state-owned banks. At the business level, ICBC reconstructed business models through application programming interface open banking, industrial digital finance, and digital green finance, thereby moving from transactional provision to ecosystem participation. At the technological level, the ECOS system served as the structural backbone that elevated technology from a supporting tool to a central enabler. At the organizational level, agile reforms and talent system construction aligned with the framework's emphasis on enabling capabilities. Based on ICBC's evolution, this study advances the McKinsey framework in two ways. It highlights a stronger policy driven strategic attribute in state-owned bank contexts, producing a dual force of policy leadership and market demand; and it supplements the framework's technological logic by extending "basic digital tools" to "foundation model led digital intelligence capabilities", thereby articulating an explicit evolutionary path from digitalization to digital intelligence. Second, ICBC's transformation exhibits commonalities with Sia-Weill-Zhang future-ready enterprise framework in following a progression of technology alignment, dual capability development, and ecosystem reconstruction, while also manifesting distinctive features of large state-owned banks. In particular, ICBC places greater emphasis on top-level strategic coordination anchored in national policy, which facilitates group-wide synchronous implementation, and its large model applications and green finance digitization are broader in scope and more policy embedded than those observed in market driven cases.

On this basis, this study proposes a four-dimensional evolution model for the digital transformation of large state-owned banks that explicates the core industry shift from digitalization to digital intelligence and offers an analytical lens tailored to institutional characteristics of state-owned large banks. The McKinsey's 3+1 framework is thereby extended to incorporate policy driven strategy and technological upgrading toward foundation model capabilities, improving its applicability to the current phase of financial technology development. The study also has limitations. First, the analysis relies primarily on secondary public sources and does not integrate internal primary interview data, limiting access to granular decision-making logic and implementation detail. Second, as a single case study of a leading state-owned bank, the generalizability of findings to joint stock banks and small and medium sized banks requires further validation. Future research directions include continued longitudinal tracking of ICBC to assess the empirical effectiveness of foundation models across operational scenarios; comparative multi-case studies that incorporate diverse bank types to validate and refine the proposed framework; and primary field research using internal interviews and process data to examine microlevel mechanisms of organizational change and decision-making during transformation.

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