LUND UNIVERSITY
School of Economics and Management

Lund University, School of Economics and Management

Department of Business Administration

BUSN79

Business Administration

Degree Project in Accounting and Finance

2025 spring

The impact of digital transformation on corporate internal control - Based on the case analysis of China Construction Bank

Authors:

Yucheng Zhang

Baoying Xiang

Supervisor:

Anders Anell

May 2025

ABSTRACT

Seminar date:3 June 2025

Course: BUSN79 - Degree Project in Accounting and Finance

Authors: Yuchen zhang and Baoying Xiang

Groups: Thesis group 27

Supervisor: Anders Anell

Examiner: Anna Glenngård

Five keywords: digital transformatio, internal control, digital technology, agency theory, COSO Framework"

Purpose: This study aims to analyze the impact of digital transformation on internal control of CCB and examine how digital transformation reshapes CCB's internal control framework (based on the COSO framework) and the challenges the company encounters in digital transformation.

Methodology: A single case study analysis was conducted based on the China Construction Bank and semi-structured interviews were used to collect empirical data.

Theoretical perspectives: This paper adopts agency theory as the theoretical perspective and uses COSO as the main framework

Empirical foundation: In the empirical chapter, the data of this article comes from CCB and qualitative research is conducted

Conclusions: Based on the comprehensive case study of China Construction Bank (CCB), digital transformation significantly enhances internal control efficiency through processes and data-driven risk management under the COSO framework, yet introduces new challenges including technology dependency, data security risks, and institutional misalignment with emerging digital governance demands.

Acknowledgements

This paper was written by two students from Lund University School of Business in the spring semester of 2024.

We would like to express our sincere gratitude to all the interviewees who took the time to participate in our interviews despite their busy schedules. Without their help, there would be no way to complete the full empirical analysis. We would also like to thank our supervisor, Mr. Anders Anell, for his continuous and patient guidance in writing our paper. Finally, we would also like to thank all the teachers, family, and friends who helped us during our master's program.

Yuchen Zhang

Lund, May 2025

Baoying Xiang

Lund, May 2025

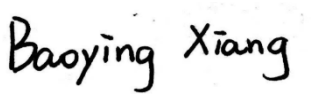


TABLE OF CONTENT

Abbreviations list

COSO

Committee of Sponsoring Organizations of the Treadway Commission

Represents the internal control framework (five components: Control Environment, Risk Assessment, Control Activities, Information & Communication, Monitoring Activities).

CCB

China Construction Bank

Case study subject.

AI

Artificial Intelligence

Applied in risk control, customer service, and other scenarios.

ESG

Environmental, Social, and Governance

A new risk assessment dimension for banks.

RPA

Robotic Process Automation

Enables automated process control.

ERP

Enterprise Resource Planning

Integrated management system.

IT

Information Technology

Covers system security, disaster recovery, etc.

SaaS

Software as a Service

Digital tool for enterprises.

SOX

Sarbanes-Oxley Act

U.S. compliance requirements for listed companies.

NDRC

National Development and Reform Commission (China)

(Policy-making authority.)

PBoC

People's Bank of China

(Financial regulatory institution.)

ECLAC

Economic Commission for Latin America and the Caribbean

Cited for digital transformation research.

1. Introduction

1.1 Background

With the rapid development of information technology, the global economy is accelerating into the digital economy era with data-driven as the core. Emerging digital activity tools such as cloud computing, big data, artificial intelligence, and blockchain are constantly improving, profoundly changing the business logic and competitive landscape of traditional industries (Brynjolfsson & McAfee, 2014; OECD, 2020). Especially in the post-COVID-19 era, the pace of digital transformation in enterprises has accelerated significantly. The emergence of COVID-19 has accelerated the development of the digital economy (Kan et al., 2022), and the digital transformation of commercial banks has also been influenced by COVID-19, accelerating the pace of development (Zhu&Jin, 2023).

China has entered a strategic acceleration stage in digital development. According to the "14th Five-Year Plan for Digital Economy Development", China has clearly proposed to promote the deep integration of digital technology and the real economy and build an internationally competitive digital industry system (National Development and Reform Commission,2021). As an important information-intensive and technology-driven industry, the financial industry is at the forefront of digital transformation. China's banking industry has made continuous breakthroughs in financial technology, intelligent risk control, digital credit and other fields, but it is also facing increasingly severe challenges in data security, system stability and regulatory compliance (People's Bank of China, 2020).

In this context, the internal control system of commercial banks is also facing profound reconstruction pressure. Traditional internal control mechanisms are mainly based on static processes, manual review and post-event supervision, relying on paper vouchers and manual experience. However, in a highly digital business environment, banks are increasingly relying on automated systems, data-driven risk control logic and platform-based operating models, prompting internal control concepts, mechanisms and tools to keep pace with the times (Li, 2022). How to ensure the effectiveness, security and compliance of internal control while maintaining operational efficiency has become a core problem in the transformation process.

This paper aims to use agency theory to discuss the impact of digital transformation on the internal control of China Construction Bank under the COSO framework.

1.2 Problematization

Based on the five-element framework of internal control proposed by the COSO Committee (control environment, risk assessment, control activities, information and communication, supervision), current research has focused on its applicability in corporate governance (COSO, 2013), but related research on how to combine this framework with the organizational structure, technical architecture and cultural soil of China's commercial banking industry is still relatively weak.

On the other hand, Jensen and Meckling (1976) put forward the "principal-agent" problem, also known as agency theory. They pointed out that the management of enterprises is not only the executor of institutional and technological changes but also the agent of decision-making, which leads to weakened control and blurred responsibility boundaries. Agency theory also emphasizes (Jensen & Meckling, 1976) that information asymmetry, inconsistent goals, and supervision costs are important institutional variables affecting the effectiveness of internal control. In the subsequent extended research of agency theory, as Boot et.al (2021) stated, digital monitoring tools (such as real-time dashboards and AI-based credit scoring systems) have fundamentally changed the traditional principal-agent relationship in the banking industry. By reducing information asymmetry, headquarters can gain an unprecedented understanding of the operations of branches. Therefore, when studying the impact of digital transformation on internal control in enterprises, it is crucial to incorporate the agency theory into the analytical perspective.

1.3 Research Purpose

With the deepening integration of big data, cloud computing, artificial intelligence technology and the banking industry, the internal operation and control system of China Construction Bank is also quietly changing. This study aims to analyze the impact of digital transformation on the internal control of China Construction Bank and try to answer the following two core questions:

How do digital control activities reshape China Construction Bank's internal control practices in terms of control environment, control activities, information communication, risk assessment and monitoring mechanisms?

What internal control challenges does China Construction Bank currently face in digital transformation? How do these challenges affect its compliance and operational efficiency?

1.4 Thesis Outline

The first chapter mainly describes the background and purpose of this study. The second

chapter is the methodology, which describes the design of this study, literature review, and data collection methods and selection. The third chapter is a detailed literature review chapter, followed by the fourth chapter, which is a theoretical chapter, especially emphasizing the agency theory that this paper focuses on. The fifth chapter is the finding part, which introduces the empirical analysis data obtained in this paper. The sixth chapter is the discussion part, which discusses the main findings of the fifth chapter in detail. Finally, the seventh chapter is the summary.

2. Methodology

2.1 Research Design

This paper aims to explore the impact of digital transformation on internal control in enterprises through qualitative research, and selects China Construction Bank as the case study object. The reason for choosing qualitative research over quantitative research is that qualitative research is more suitable for exploring complex and dynamic organizational processes. The interaction between digital transformation and internal control is not merely a linear relationship between variables, but involves a complex coupling among organizational structure, control logic, governance culture, and technology application. Such complex phenomena are often difficult to fully depict through preset variables and quantitative indicators (Eisenhardt, 1989). Moreover, as a large state-owned bank, China Construction Bank's digital transformation and internal control are significantly influenced by specific policies, regulations, and cultural contexts. As Yin (2014) pointed out, qualitative research emphasizes understanding the context and can reveal the interaction between institutional forces and organizational behavior.

Due to the time and resource constraints of a master's thesis, this paper adopts a retrospective case analysis approach, focusing on the impact of the completed stages of digital transformation on the internal control of China Construction Bank. This retrospective case analysis method can also provide sufficient evidence for how internal control mechanisms adapt to technological changes (Bell,et al., 2019).

This paper adopts a single-case study design, focusing on the correlation between digital transformation and internal control in China Construction Bank. China Construction Bank is chosen as the case study company because it has been relatively early in the digital transformation of large state-owned banks in China, and its internal control processes and levels are relatively standardized, making it easier to conduct in-depth research (Yin, 2014). On the other hand, at the beginning of case selection, the aim was to compare the impact of digital transformation on internal control under different institutional contexts, but due to the limitations of actual access channels and resources, it was ultimately decided to conduct research on a single case company to ensure a detailed and comprehensive study of the case company. Of course, this also means that the conclusions drawn in this paper are highly dependent on the case

company.

In conclusion, this paper, through the case analysis of China Construction Bank, aims to discover the possible impact of the digital wave on the internal control mechanism of enterprises. This case study method can not only fill the theoretical gap but also provide practical references for similar financial institutions (Eisenhardt & Graebner, 2007).

2.2 Literature review

This study mainly searches for keywords such as "digital transformation", "internal control", "digital technology", "agency theory", "commercial banks", and "COSO Framework" through official websites of databases or reports such as CNKI, Google Scholar, Wanfang, and ScienceDirect, and gives priority to classic, highly read, or literature from various regions in the past five years, while eliminating duplicate, irrelevant, and low-quality content to ensure the validity and accuracy of the information in this article.

2.3 Data collection and selection

2.3.1 Data source

This paper first collects first-hand data through semi-structured voice interviews, text interviews, video interviews, etc., and thoroughly reads the annual reports of China Construction Bank from 2022 to 2024 as well as the periodic interviews, with a focus on digitalization. To ensure the accuracy of the research content, this paper needs to ensure the accuracy and comprehensiveness of the information collection sources. China Construction Bank is a large state-owned bank and one of the largest banks in the world. In addition, the financial statements of China Construction Bank are prepared in accordance with Chinese accounting standards and are substantially consistent with IFRS (2022 annual report). Moreover, the domestic and overseas auditing institutions of China Construction Bank are PricewaterhouseCoopers Zhong Tian Certified Public Accountants (PwC Zhong Tian) and PricewaterhouseCoopers Hong Kong Certified Public Accountants (PwC Hong Kong), respectively. Both of these institutions are member firms of PricewaterhouseCoopers and use the same global auditing methodology (such as PwC Audit Methodology) and risk control processes. According to the disclosures in the 2022-2024 annual reports of China Construction Bank, both institutions issued standard unqualified audit reports for China Construction Bank. As of 2024, the credit ratings of China Construction Bank by the three major international

rating agencies (Moody's, S&P, and Fitch) are A1, A, and A+, respectively, and the outlooks are all stable. This proves that the annual reports, ESG reports, risk management announcements, and technology development strategy documents regularly released by CCB each year are of high quality, high transparency, and high credibility. These documents provide rich research material sources at both structured and unstructured data levels (Bryman & Bell, 2015). On the other hand, the industry in which the company operates is closely related to the author's major in accounting and finance. At the same time, compared with other commercial banks, the author is more familiar with the employees of this company and can more easily conduct interviews with the internal employees of the company for a more comprehensive study.

2.3.2 Case company selection

In order to ensure the accuracy of the research content, this paper needs to ensure the accuracy and comprehensiveness of the information collection source. CCB is a large state-owned bank and one of the largest banks in the world. In addition, CCB regularly publishes high-quality annual reports, environmental and social governance (ESG) reports, risk management announcements, and technology development strategy documents every year. These documents provide a rich source of materials for research at the structured and unstructured data levels (Bryman & Bell, 2015). On the other hand, the industry in which the company is located is closely related to the accounting and finance major studied by the author of this article. At the same time, compared with other commercial banks, the author of this article is more familiar with the company's employees and it is easier to interview the company's internal employees for in-depth research.

2.3.3 Data collection

Semi-structured interviews

This paper uses semi-structured interviews as one of the main data collection tools to deeply understand the actual impact of digital transformation on the internal control mechanism of China Construction Bank. Semi-structured interviews combine the advantages of structured and unstructured interviews, not only ensuring that the research topic is systematically covered, but also giving the author space to flexibly ask questions based on the content of the interviewee under the premise of setting a basic question framework, thereby capturing more levels and rich content. (Kallio, 2016)

In addition, semi-structured interviews are particularly suitable for studying the processes and social contexts of complex organizations. For example, the impact of digital transformation on corporate internal control, the topic of this article, involves issues such as organizational culture, management logic, and technology integration.

Standardized questionnaires are difficult to reveal their deep meanings, while semi-structured interviews can provide richer contextual data through detailed descriptions and examples from the interviewees (Gill et al., 2008).

Selection of interviewees

When we started writing this article, we immediately thought of participant A (due to anonymity request) when we thought of the selection of interviewees. He has worked in China Construction Bank for nearly 30 years as a senior manager of CCB in XX region (for privacy protection). He has led many business sectors of CCB in the region, especially in key areas such as strategy, technology, and risk control. This is highly relevant to the key part of our writing. We met him in other business activities in the early years. When he learned about our simple paper description and interview requirements, he was happy to help us. Participant B is a college classmate of one of our authors. He is now the head of the customer service department of a certain region of CCB. During the communication with him, he introduced us to participant C. Participant C is the head of the risk management department in his region. Interviewing him can further increase the breadth and depth of our interview. Participants D-H were introduced by participant A. When we expressed to participant A that we hoped to get some perspectives from front-line employees, he recommended five employees from different departments of participants D-H who were willing to be interviewed by us. They came from different positions such as the technology department, human resources department, and tellers.

First Communication

Since different participants were familiar with different members of our team, the initial interviews were primarily conducted via the messaging app WeChat. We communicated with different participants through text and voice messages to confirm interview details and obtain their consent. To ensure smooth and accurate communication, both Mandarin and Cantonese were used during telephone conversations. For details, please refer to Appendix A.

Second Communication

In the second communication, we prepared two different versions of the final interview framework for participants A-H and determined the interview format, with the final interview to be conducted jointly by team members. For the three senior managers (participants A-C), we designed questions with a broader perspective and higher level of abstraction (Appendix B) to ensure sufficient space for both interviewers and

interviewees to ask and answer questions. Due to resource and time constraints, we discussed with participants D-H and decided to conduct the interviews in an informal format. To help participants understand and answer our questions, we provided answering techniques for some abstract questions and those that might be easily misunderstood after participant feedback, to ensure the validity and accuracy of the interview results (see Appendix C; Appendix C is only an example and not a fixed set of questions).

Final Communication (Formal Interview)

The final interviews were conducted by group members, with the two authors serving as interviewers and recorders, respectively. All three video interviews were conducted in Chinese to avoid communication barriers. Due to the interviewees' requests, none of the three video interviews were recorded; instead, the recorder took detailed notes, which were later organised and compiled by group members after the interviews. The video interviews were conducted using Tencent Meeting (due to regional restrictions, tools like Zoom were not used).

Participant ID	**Interview Date**	**Interview Mode**	**Department**	**Role/Position**	**Duration**
Participant A	4 May 2025	Video Call	Senior Management	Strategic/Executive Role	30 minutes
Participant B	6 May 2025	Video Call	Customer Service	Department Head	30 minutes
Participant C	6 May 2025	Video Call	Risk Management	Department Head	30 minutes

(Table 2.1) Summary of interviews with participants A-C

Informal interview

For the five participants in D-H, this study employed an informal interview format. (Table 2.2) Kvale & Brinkmann (2009) argue that unstructured interviews are more suitable for exploring ‘tacit knowledge’ (such as frontline employees' actual perceptions of work processes) rather than pre-set theoretical frameworks. The five participants D-

H are all frontline employees of CCB. Using an informal interview format allows them to feel more at ease during the interview while also better reflecting the interviewees' subjective perspectives. On the other hand, informal interviews can be initiated at any time, making them suitable for the high-intensity, fragmented work patterns of frontline employees (Tucker et al., 2008). Unstructured interviews do not use any fixed questions but instead involve the interviewer asking open-ended questions based on specific research themes (McLeod, 2024). To ensure the validity of the interviews for the thesis, the first informal interview topics were primarily designed based on the COSO five elements (Tbale2.3), while the second informal interview topics were primarily supplementary follow-up questions based on the respondents' answers from the first interview. Additionally, due to the fragmented work patterns of frontline employees, which may prevent timely responses, to better summarise the informal interview section, this study defined all responses recorded within a 6-hour timeframe as a single interview, with all recording times based on Stockholm Time Zone, and all informal interviews completed by 15 May 2025.

Respondent	**Times of interviews**	**Interview date**	**Interview duration**	**Communication**	**Data format**
D	2 times	First time: May 6 , 2025 Second time: May 13 , 2025	First time: 3 hours, second time: 15 minutes	First time: WeChat voice + text Second time: WeChat call	Notes and Memoirs
E	2 times	First time: May 6 , 2025 Second time: May 13, 2025	First time: 1 hours, second time: 1 hours 15 minutes	First time: WeChat voice + text Second time: WeChat voice + text	Notes and Memoirs

Respondent	Times of interviews	Interview date	Interview duration	Communication	Data format
F	2 times	First time: May 6 , 2025 Second time: May 14 , 2025	First time: 3 hours 35 minutes second time: 4 hours	First time: WeChat voice + text Second time: WeChat voice + text	Notes and Memoirs
G	2 times	First time: May 7 , 2025 Second time: May 14 , 2025	First time: 5 hours 20 minutes second time: 30 minutes	First time: WeChat voice + text Second time: WeChat call	Notes and Memoirs
H	2 times	First time: May 7 , 2025 Second time: May 14 , 2025	First time: 3 hours second time: 6hours	First time: WeChat voice + text Second time: WeChat voice+text	Notes and Memoirs

(Table 2.2 Informal Interview Schedule)

Theme	Core purpose	Sample question (open-ended)
1. Digital Tool Experience (Control Environment)	Understand the actual application effects and adaptability of digital tools by grassroots employees	What is the digital tool you use most frequently in your daily work? How did it change your original workflow?

2.Process Changes and Compliance Perception (Risk Assessment)	Explore whether digitalization has simplified internal control processes or brought about new compliance challenges	After some of the work that relied on manual review in the past was replaced by the system, do you think it is more reliable or more error-prone?
3. Cross-departmental collaboration (Information and Communication	Identify the problems of interdepartmental collaboration in digital transformation	When collaborating with other departments (such as the technology department), do conflicts arise due to system incompatibility or data silos?
4. Skills Training (Control activities)	Understand whether the digital capabilities of grassroots employees match the demands of transformation	Is the digital training provided by the bank sufficient? Which skill do you most wish to enhance?
5. Moral Hazard and Compliance (Monitoring)	Understand the short-term and fraudulent behaviors caused by digital transformation and automated assessment	Do you think there are any unreasonable aspects in digital assessment? Has the bank put forward new requirements for your professional ethics and compliance after the digital transformation?

(Table2.3 The topic of the first informal interview)

2.4 Data Analysis

After recording and organizing the video interviews and semi-structured questionnaires, this paper fed back the results to different interviewees and obtained their approval and consent. The interview responses were organized in different chapters of this paper. In

semi-structured interviews, considering the social expectation bias of the interviewees (Fontana & Frey 2005), the interviewer may provide "answers that are considered appropriate or ideal", especially when it comes to sensitive topics such as internal control. This paper combines document analysis and observation to compare the views of the three interviewees, cross-verify the information, and thus make up for the bias in the interview. In order to increase the readability and interpretability of this paper, this paper classifies and organizes the interviewees' responses according to the COSO five-factor framework. At the same time, considering that Chinese has a high-context culture, words may have multiple cultural metaphors and social codes at the same time, which is easy to produce multiple interpretations. This paper also adopts a reflective analysis strategy (Alvesson & Deetz, 2000). The two authors respectively made preliminary interpretations of the interview results to avoid the bias of subjective understanding. For the discussion of key topics, the author of this paper explained and verified from different perspectives based on his own understanding.

2.5 Reliability and validity

To ensure the validity and credibility of the information, all interview questions were designed according to the same outline, using a standardized questioning framework for semi-structured interviews to ensure strong consistency between different interviews (Lincoln & Guba, 1985). At the same time, the interview content was compiled and cross-checked by team members. After the interview, the team will return to the interviewee to ensure the clarity and accuracy of the record and to ensure that the interviewee's views are accurately restored (Shenton, 2004). At the same time, this paper also uses data triangulation verification, combining interview results, literature views and official annual report data for cross-checking to ensure the internal validity of this paper's results (Patton, 1999). In addition, this paper uses China Construction Bank as a single case company, and its external validity may be insufficient. However, its experience in internal control and digital transformation is highly representative among China's large commercial banks, and has a strong reference significance for financial institutions with the same institutional background and digital transformation stage.

2.6 Ethical considerations

In this study, to ensure that the data collection process meets ethical requirements, the researchers strictly abide by the ethical principles of qualitative research, focusing on informed consent, anonymity, data confidentiality and voluntary participation of

participants. Bryman and Bell (2015). When the author first contacted the interviewees, he informed the interviewees of the purpose of this study and that the interview content would only be used for academic research in this article, and obtained the consent of all interviewees. At the same time, for the need of interviewee anonymity, all interviewees in this article are anonymous (Interviewee A-H).

In addition, for the privacy needs of the interviewees, all video interviews were not recorded, and only detailed notes were recorded by the recorder. At the same time, after the interview, the interviewer fed back the organized meeting minutes to the interviewee to determine the accuracy of the record and whether it can be used for this study. During the interview, the interviewer will avoid all sensitive topics to avoid negative impact on the interviewee (Saunders 2019).

2.7 Limitations

Since we only use CCB as a case company, and due to resource and time constraints, the number of interviewees is small, only 8, so the conclusions and external validity of the study are relatively lacking. In addition, due to the interviewee's request, the interview was not recorded in this paper, and some interview details may be lost. From the perspective of qualitative research, qualitative research emphasizes the author's interpretation and definition, so this paper has a certain degree of subjectivity. The same data may be interpreted by different researchers and different conclusions may be drawn. Therefore, the repeatability and verifiability of the research results of this paper need to be improved (Patton, 1999).

3. Literature Review

3.1 Evolution of internal control and COSO framework

The COSO framework refers to the definition of internal control by the US Anti-Fraud Committee as a process implemented by the board of directors, management, and other personnel to achieve the three goals of operation, reporting, and compliance. (COSO, 1992, 2013)

The COSO Framework was first proposed by the COSO organization in 1992 in response to the anti-fraud initiative advocated by the Treadway Commission. It provides a reference standard for the formulation of internal control for organizations to achieve efficient operations, legal compliance, and reliable financial reporting. It divides the internal control factors of an organization into five aspects, namely control environment, risk assessment, control activities, information communication and monitoring. (COSO1992) With the advancement of society and technology, digital tools such as SaaS and cloud platforms are gradually applied to the operation of enterprises. With the advancement of globalization, cross-border business activities are more frequent, which increases the diversity of business activities and makes legal compliance more difficult and complicated. Information islands, new frauds, and employees holding two conflicting positions at the same time are frequently exposed. In response to such incidents, managers have legal supervision requirements, such as the promulgation of the iconic Sarbanes-Oxley Act (SOX).

In 2013, the new version of the COSO Framework came into being. The new version of the framework retains the original definition and three objectives, and further expands the scope of the reporting objective, including but not limited to financial reporting; on the basis of continuing the five major factors of control, 17 principles are further proposed, which is a further explanation and enhancement of the original content, making the implementation of the control plan more feasible for the organization. (Protiviti Inc. 2013) In terms of control environment factors, new content has been added, such as the independence of the board of directors, talent training and attraction, and the clarification of responsibilities and the linking with performance; in terms of risk assessment factors, more attention has been paid to fraud risk assessment, which has always been regarded as an independent principle, and a more detailed identification mechanism for major changes has been established; in terms of control activities factors, IT controls have been added to cope with the increasing number of digital applications, and the control deployment at three different levels of system,

procedure and macro entity has been strengthened, and the control of procedures and execution has been clearly distinguished; in terms of information and communication factors, the multi-dimensional circulation of information across departments and functions, the accuracy and timeliness of information transmission, and the importance of accurate information transmission to stakeholders have been emphasized; in terms of monitoring activities factors, the combination of continuous evaluation and independent evaluation has been added and applied to different scenarios, as well as the mechanism for timely discovery of problems in internal control and timely reporting, have been added, emphasizing the sustainable closed loop of feedback-rectification-monitoring. (COSO 2013) This fully shows that the COSO Framework is dynamic, not static. It is not a rigid framework that is unchanging. It can adapt to the pace of the times and make corresponding adjustments.

This study aims to explore the impact of digital transformation on the internal control of China Comercial Banks through the COSO framework. The five elements emphasized by the COSO framework are highly consistent with the requirements of Chinese regulators, especially the banking industry, for internal control. For example, the China Banking Regulatory Commission proposed in the "Guidelines for Internal Control of Commercial Banks" in 2014: The internal control system of banks must be risk-oriented and comprehensively build an internal control structure from the dimensions of control environment, process, system, and monitoring.

3.2 Research on Digitalization and Enterprise Internal Control (Pan-Enterprise Research)

3.2.1 Digital Control Activities

The so-called Digital Control is a control logic embedded in an information system. It combines multiple engines such as automation, artificial intelligence, data analysis and workflow to help enterprises' control activities rely on data to drive, realize automatic triggering, get rid of the reliance on multiple manual operations or sampling inspections, and realize the sustainable operation of control activities, thereby helping enterprises to establish or improve the mechanism for internal control activities of enterprises and improve the organization's monitoring, testing and compliance capabilities. Specifically, it includes Controls Automation (such as ERP, AI, RPA process control automation, automatic log generation), Full-Population Testing (control no longer relies on sample

testing, but analyzes all data in the enterprise and the system automatically identifies), real-time monitoring and feedback (such as triggering corrective actions) and process embedding and workflow management (such as enforcing processes under digital control to eliminate skipped steps). (Deloitte, 2022)

3.2.2 The positive impact of digitalization on internal control of enterprises

There are still many research papers on the impact of digitalization and internal control of enterprises. Digital transformation has a significant role in improving and enhancing the internal control of enterprises (Oluwagbemi et al. 2011; Xiong & Guo, 2024; Qin, 2024; Wang et al. 2023). First, digital transformation can increase the transparency and accessibility of information to a large extent (Oluwagbemi et al. 2011). Enterprises obtain real-time data, control rules and risk thresholds by accessing AI systems, and use visual dashboards to strengthen management's perception and intervention capabilities of control status (Shaban & Omoush, 2025). Siemens has achieved full-process operation records by embedding real-time monitoring and process logs into the SAP system, significantly improving control transparency and accountability (Alles et al., 2008). The so-called "traceability practice" means that enterprises use technologies such as the Internet of Things, blockchain and AI to automatically collect and record key supply chain data, build a data chain with "source traceable and destination traceable", and achieve full-process supervision (Zhou & Xu, 2023). Secondly, the digital transformation of enterprises can also reduce the agency costs of enterprises and improve the quality of internal control. Digital transformation reconstructs the internal control system of enterprises, and the operation management and risk control of enterprises have become more standardized. The probability of human operation errors and information input errors has been greatly reduced. (Oluwagbemi et al. 2011) The operation of enterprises has become more standardized and stable, and the agency costs have been reduced accordingly. The mechanism also reduces human bias and discretion through rule preset and threshold control, ensures consistency of standards, and realizes automatic marking of fraud and risk transactions through anomaly detection, thereby improving identification capabilities and prevention and control levels (Ogundimu, 2025) Thirdly, the impact of digital transformation on internal control will be greatly affected by the characteristics of managers. Managers with strong capabilities will make the performance of internal control better. (Xia & Zhang, 2023) Fourthly, digital transformation can improve the efficiency of internal control of enterprises. The use of artificial intelligence, real-time data, et al. in the context of digital transformation allows enterprises to make full use of their resources and greatly improve the efficiency of resource allocation. Fifthly, digital transformation can also improve and innovate the

decision-making mechanism of internal control. The use of real-time data, big data analysis, etc, can enable enterprises to accurately grasp market trends and improve decision-making capabilities and efficiency. The system that combines artificial intelligence for decision-making also optimizes the decision-making method of internal control of enterprises. (Oluwagbemi et al. 2011; Hao, 2025)

3.2.3 Negative impact of digitalization on internal control of enterprises

However, the impact of digital transformation on internal control of enterprises is not always positive. First, the interoperability between various systems within the enterprise is weak, which is not conducive to information communication. (ECLAC, 2024) Second, high automation makes the internal governance of enterprises more complicated, but the overall digital transformation awareness of some enterprises cannot keep up with the degree of their own digital transformation, so they cannot realize that the old internal control system can no longer adapt to the new development requirements. Third, the internal control system of many enterprises is very backward and cannot meet the current structural changes, which will bring many crises and risks to the enterprises. (ECLAC, 2024; Hao, 2025) Fourth, the talent structure of enterprises after transformation does not match the actual needs. Enterprises often face the problem of talent shortage and the gap in digital literacy among employees is large. (Oluwagbemi et al. 2011; Hao, 2025) Fifth, the maintenance costs required by enterprises after digital transformation are further increased. The use of technology has brought many security risks to enterprises, such as personal information protection, which is a major difficulty in internal control of enterprises(Oluwagbemi et al. 2011).

3.3 Research on Digitalization and Enterprise Internal Control in China

Under China's unique background, digital control activities have bred a unique internal control system. The transformation effect of state-owned enterprises is better than that of non-state-owned enterprises, and non-manufacturing is better than manufacturing. (Xiong & Guo, 2024) Especially in China, the government has provided strong support to state-owned enterprises in terms of funds, strategies and policies (Xia & Zhang, 2023). Under the digital background, the digitalization of the internal control system of Chinese enterprises often takes the approach of "easy first, difficult later, finance first, business later", and the digitalization of standardized businesses such as funds, procurement, and contracts is the most common. With the help of information systems, the control activities and control means of the COSO framework have realized process

embedding and node warning, so as to identify and control risks in the process of handling business and approval. Chinese enterprise transactions have the characteristics of smaller amounts, higher frequencies, and geographical dispersion. Chinese enterprises respond to this transaction characteristic through the unique digital control of "system + rules + coding". This standardized, process-based, and automated control mechanism can help Chinese enterprises ensure that transactions are error-free, risks are controllable, and data is shared. (Li, 2025) In Chinese manufacturing enterprises, digital transformation can help optimize governance and alleviate agency conflicts in the internal control system. And the higher the degree of digitalization of the enterprise, the stronger the role it can play. Digital technology enhances the authenticity and sharing of internal control information, accelerates the process of intelligent risk assessment, and helps Chinese manufacturing enterprises to amplify the role of internal control under digital transformation. (Ouyang, 2025) Chinese enterprises are currently facing serious data fragmentation, information lag, and formalized and lengthy processes. Enterprises generally build a "system + rules" responsibility chain control mechanism through digital upgrades. This embedded mechanism can achieve the effect of "pre-prevention + in-process control". This shift from institutional dependence to technological dependence reflects a major change in China's internal control paradigm. (Tan, 2025) In the context of "state-owned enterprise governance structure" with Chinese characteristics, the management model within the system, heavy compliance pressure, and concentrated information but slow response are typical characteristics of Chinese state-owned enterprises. The internal control structure of state-owned enterprises must be highly standardized because they will face stricter compliance requirements and policy supervision in the process of promoting digital transformation. However, some state-owned enterprises will experience a situation where the degree of digitalization is too fast while the internal control mechanism is still lagging behind. This advanced system and lagging control means have formed a "control vacuum" or "repeated control" problem (Lv & An, 2025).

‘

There are principles for the reconstruction of China's internal control mechanism. Zou (2025) discussed how digitalization reconstructs the mechanism of internal control - enterprises shift from the "after-the-fact remedy" thinking of traditional control to the "real-time intervention" thinking of digital control in terms of control concept; from the control mechanism, the past written "process documents" and institutional clauses are integrated into the system "embedded control mechanism" because the cumbersome documented processes in the past are difficult to adapt to the current high-frequency trading and multi-subject operation scenarios in China; from the control architecture,

there is a shift from "organizational nested processes" to "platform-driven processes". Through the systematic path of concepts and mechanisms, it interprets how Chinese enterprises promote the upgrading of internal control systems in the context of digital transformation.

3.4 Research gaps

Previous studies have mostly studied the relationship between digital transformation and internal control from a pan-enterprise perspective, and most of these studies remain at the manufacturing or general enterprise level, while research on the financial industry with specific high compliance requirements is extremely scarce, especially research on the digitalization and internal control of Chinese commercial banks. In the Chinese context, research on internal control and digitalization mostly focuses on the description of phenomena and mechanisms, and lacks the use of theory to explore the reasons for the changes in the internal control mechanism behind them. Currently, no research has applied digital technology to the reconstruction of the five elements of COSO internal control in Chinese commercial banks for analysis. Although some literature has made a basic and preliminary explanation of the mechanism of digital control from the perspective of agency theory, how to establish a close connection between this theory and practice mechanism and apply it to the specific context of Chinese commercial banks is still a blank. Therefore, it is necessary to start from the industry perspective and combine agency theory to deeply explore the occurrence mechanism of digital transformation reshaping the five control elements of commercial banks.

4 Agency Theory

4.1 The development of the theory and core concepts

Agency theory originated from the discussion of the issue of "separation of ownership and control" in the modern enterprise system. Its core position is the problem of reduced internal governance efficiency and increased costs caused by conflicts of interest and information asymmetry between principals and agents (Jensen & Meckling, 1976). Agency Theory believes that enterprises are the nexus of contracts, and agency relationships are the basic structures that are prevalent in organizations. How to maximize the agent's behavior to meet the interests of the principal through institutional design is the core issue of its exploration. Agency Costs refers to the efficiency deviation and cost caused by different goals and information asymmetry between principals and agents, which is a core concept of agency theory.

Fama (1980) said that even in the absence of external supervision or incentives, the organizational structure itself can self-execute supervision mechanisms and constrain agent behavior through institutional arrangements such as separation of responsibilities, process nesting and institutionalized authorization. Fama and Jensen (1983b) then divided decision-making power into "decision management" (initiation and implementation) and "decision control" (ratification and monitoring) from the perspective that enterprises are "institutionalized contract systems", and empowered and supervised them respectively through the system, which can effectively reduce agency costs and ensure that the organization achieves its goals. By giving initiation, approval, execution and supervision to different agents respectively, the agency problem caused by insider control can be effectively avoided.

Jensen & Meckling(1976) extended the agency model to multiple agency situations. He said that when agents face multiple principals such as managers, customers, and boards of directors at the same time, clear division of responsibilities, process authorization mechanisms and information sharing rules can help reduce the governance risks caused by incentive mismatch and control vacuum.

Eisenhardt (1989) believes that agency theory reveals the principles behind risk sharing, information processing and incentive mechanisms in organizations, and is a study of

organizational systems with strong compliance requirements and goal differences such as commercial banks. In addition, the agency relationship not only refers to the relationship between shareholders and management, but also includes a variety of entrustment relationships between managers and employees, headquarters and branches, and even system designers and data executors. Shleifer and Vishny (1997) advocated the governance of agency problems through comprehensive control rights structure, rule of law environment and organizational system design.

Deumes & Knechel (2008) pointed out that internal control can be used as a monitoring mechanism to reduce the efficiency loss of agency conflicts because the system provides management with more reliable financial reporting information. An important proposition of agency theory is that managers have an incentive to spend resources on monitoring to reduce the efficiency loss of agency problems. In the absence of monitoring, investors will expect that the interests of managers will diverge from their interests and take this into account when pricing corporate rights.

4.2 The Composition and Expression Mechanism of Agency Costs

Jensen & Meckling (1976) first proposed the composition of agency costs. They divided agency costs into monitoring costs, bonding costs and residual loss. This definition is still the core theoretical basis for understanding corporate governance and internal control design. Monitoring costs refer to the costs incurred by the principal to monitor whether the agent is in line with its interests (such as audit fees), bonding costs refer to the costs voluntarily borne by the principal after the agent proves that its behavior is in line with the principal's interests (such as executive salaries), and residual loss refers to the efficiency loss caused by the inconsistency between the interests of the agent and the principal (such as the agent abandoning a long-term value project to avoid its own risks).

Information manipulation and asymmetry, goal mismatch and execution deviation, moral hazard and compliance laxity, and ambiguity in responsibility are all specific manifestations of agency costs in organizations. Fama and Jensen (1983a) pointed out that agents can control the judgment of organizations by controlling over information flow because they have information advantages. Agents can dominate decision-making without paying any price or taking any responsibility, which will bring implicit agency

risks to enterprises.

Structural factors such as complex division of responsibilities, cross-departmental overlap, and multiple employee incentive goals have exacerbated the complexity of agency problems in large financial organizations. Jensen & Meckling(1976) In the context of multiple agency relationships, when an agent is responsible for multiple principals at the same time, its goals are often difficult to unify, which can easily lead to coordination failures, responsibility disputes, and other problems.

Eisenhardt (1989) pointed out that the key to agency problems lies in the effectiveness and sustainability of the supervision mechanism. If the supervision structure is unclear or lacks process transparency, no matter how good the incentive system is, it is difficult to avoid the negative impact of agency problems. This provides a theoretical basis for the construction of mechanisms such as process embedding, authorization mechanism, digital accountability, and operation traceability in the internal control system.

Deumes & Knechel (2008) used the COSO (1992) framework to construct an internal control disclosure index in their research, emphasizing that internal control can be used as a monitoring mechanism to reduce the efficiency loss of agency conflicts. Deumes & Knechel (2008) emphasized that internal control reporting can reduce the efficiency loss of agency problems caused by information asymmetry. Managers may have an incentive to proactively disclose internal control information to reduce capital costs, because reducing information asymmetry can reduce the risk of investors predicting future returns on investments. Internal control disclosure can also reduce estimation risk because internal control mitigates the threat of providing unreliable information to investors.

4.3 Institutional Embedding and Control Execution

Fama (1980) proposed that organizations need to establish internal control mechanisms with "self-reinforcing" characteristics to effectively alleviate agency problems. Such mechanisms embed institutional constraints into daily operations through process standardization and division of responsibilities, thereby regulating agent behavior without continuous external supervision. However, the effectiveness of such institutional embedding depends not only on the rationality of the design of the system itself, but also on its continued role in organizational structure and business

processes.

Eisenhardt (1989) further pointed out that the effectiveness of institutional embedding does not entirely depend on process arrangements, but is also closely related to whether agents can understand and accept institutional requirements. Only when the system is transformed into perceptible behavioral norms through standardized language, flowcharts, behavioral trajectories and system feedback mechanisms can the control system truly transform from "written rules" to "behavioral boundaries" and play a practical role at the operational level.

On this basis, recent studies have extended the perspective of institutional embedding to the field of digital governance. For example, Bozkus (2023) believes that through role authority configuration, standardized operating procedures and automated responsibility tracking mechanisms, modern enterprises have gradually embedded process control into digital systems to form a structured supervision path. The unified digital platform can eliminate differences in understanding between different levels and positions and improve the efficiency of organizational coordination by standardizing processes, terminology and roles. Shaban and Omoush (2025) also pointed out that digital systems clarify the responsible parties by setting up task processes and traceability mechanisms, effectively compressing the space for vague responsibilities and reducing the probability of buck-passing. At the same time, these systems also serve as a medium for cross-level communication and coordination to a certain extent, improving the efficiency of organizational operations.

However, some scholars have reminded that the effectiveness of technology governance is not achieved overnight. Bozkus (2023) emphasized that employees' resistance to change is one of the key factors affecting whether technological innovation can be implemented. Therefore, organizations need to help employees adapt to the dynamic environment brought about by technology through training, skills development and change management. Although the digital institutionalization path provides a new solution for agency governance, its long-term effects and adaptability in a rapidly changing environment are still worth further discussion.

4.4 Matching Task Characteristics with Contract Forms

In an agency relationship, the effectiveness of contract design depends largely on the

nature of the task and the measurability of the results. Eisenhardt (1989) proposed two basic contract forms: outcome-based contract and behavior-based contract. When the task goals are clear and the results are easy to quantify, the result-oriented contract is more effective because it can motivate the principal to work towards the goal by binding the agent's interests with the performance results; when the task is complex, the results are affected by external factors, or the results are highly unpredictable, the behavior-oriented contract is better. Behavior-oriented contracts refer to the process of incorporating agent control into an institutionalized path by setting standardized operating procedures, monitoring nodes and behavioral guidelines. The key to this type of contract is the "constraint process", which is suitable for compliance-sensitive, data-intensive or high-standardization work scenarios.

Fama and Jensen (1983a) also pointed out that the attribution of contributions and the measurement of performance become more difficult because agents assume multiple roles. Behavior-oriented contracts and embedded processes can enhance the control consistency of organizations and the clarity of employees' execution. Especially with the support of technical systems, behavioral constraints can be embedded in the system through log traces and other forms to enhance supervision intensity and behavioral transparency. This adaptation logic echoes the basic goal of agency theory, that is, under the condition of information asymmetry, the discretionary space and the resulting residual losses brought about by information asymmetry are minimized through institutional arrangements (Jensen & Meckling, 1976).

4.5 Multiple agency problems and authority governance

Based on the agency theory proposed by Jensen and Meckling (1976), subsequent studies further focused on coordination risks in multiple delegation situations. Following Fama and Jensen (1983b), enterprises facing multiple agents should establish an agency control system characterized by clear responsibilities and well-defined authority through institutional mechanisms. In a multi-agent situation, it is crucial to establish a clear and institutionalized supervision mechanism. Eisenhardt (1989) pointed out that effective contracts and monitoring structures can alleviate the failure of supervision caused by information asymmetry and limited resources. This also inspires us to achieve stable control through institutional arrangements rather than relying on individual judgment or temporary intervention.

Deumes & Knechel (2008) specifically pointed out that financial leverage is related to

agency problems between shareholders and creditors. Shareholders may have an incentive to take excessive risks, and scholars such as Jensen and Meckling (1976) suggested that higher leverage will increase agency conflicts because shareholders are more likely to transfer wealth to creditors. Therefore, financial leverage expectations are positively correlated with the degree of voluntary internal control disclosure.

4.6 Cognitive agency costs and institutional culture

Although institutional design and embedded systems can greatly reduce agency costs, if agents fail to fully understand, accept and comply with these institutional requirements, "cognitive agency costs" may still occur due to cognitive bias or psychological resistance. As Fama (1980) pointed out, institutions should not only have form and structure, but should also be transformed into behavioral norms that organizational members follow by default. However, in real situations, institutional arrangements may not really penetrate into the behavioral level of organizational members.

Eisenhardt (1989) further pointed out that the effectiveness of behavior-oriented contracts depends on the agent's cognitive acceptance of institutional norms and the clarity of the execution path. Behavioral control can only be effective when the system is easy to understand and the process is clear. However, if the system is not well disseminated, the operating methods are complicated, or there is a conflict between employee values and institutional logic, it may lead to "surface execution" and "formal compliance" of the system, forming hidden agency costs. This phenomenon is particularly prominent in the process of digital transformation.

As early as the 1980s, Schein (1983) proposed the concept of "embedded mechanism", emphasizing that organizational culture affects member behavior through institutional embedding. Therefore, the system is not only an external rule, but also should be internalized into employees' values and behavioral habits through systematic training, embedded operation guidelines, behavioral visualization and incentive mechanisms. In recent years, Bozkus (2023) further pointed out that modern digital systems, as operating platforms, use standardized language, processes and role expectations to transform system requirements into daily visible behavioral paths. This "value-oriented system embedding" helps members at different levels and in different positions reach a

consensus and reduce cognitive bias.

At the same time, Zhang (2022) also emphasized that large-scale training can not only improve employees' business capabilities and work efficiency, but more importantly, enhance their sense of identity with corporate culture and stimulate their initiative to participate in digital transformation. However, system embedding and cultural shaping are not achieved overnight. Bozkus (2023) reminded that digital transformation will bring about changes in organizational culture and promote a bottom-up empowerment and collaborative culture to replace the traditional bureaucratic decision-making culture. This change not only relies on digital tools and platforms to achieve cross-departmental and cross-team knowledge sharing and seamless collaboration, but also requires the organization to evolve from a pyramid structure to a networked and decentralized structure.

Of course, digital transformation itself also has challenges at different stages. Bozkus (2023) divides it into multiple stages. In the deployment stage, organizations need to deal with employees' concerns about the impact of new technologies on job responsibilities and prevent resistance due to fear; in the optimization stage, companies need to make full use of existing technological advantages while maintaining sensitivity and adaptability to the continuous changes in emerging technologies. It is worth noting that the effects of this process may vary significantly in different companies and cultural backgrounds, and it still needs to be dynamically adjusted in combination with the characteristics of the organization itself.

5 Empirical Findings: The impact of digital transformation on China Construction Bank

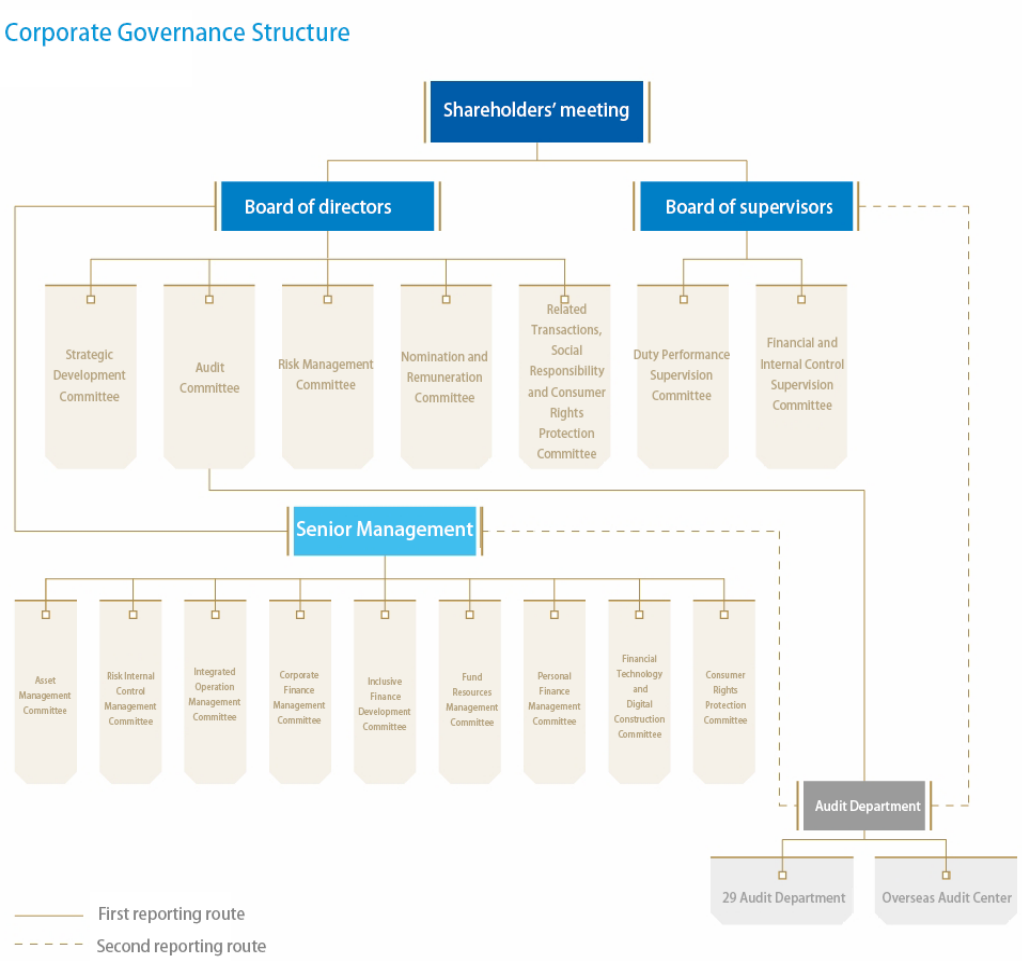
As one of China's large state-owned commercial banks, China Construction Bank's continuous investment in the field of financial technology and reforms in its internal control system provide a solid case basis for studying the impact of digital transformation on corporate internal control.

5.1 Overview of China Construction Bank

According to Baidu Encyclopedia, China Construction Bank Corporation was formerly known as China Construction Bank. It was established in 1954 and listed on the Hong Kong Stock Exchange in 2005 and the Shanghai Stock Exchange in 2007. It is one of China's systemically important banks. As of the end of 2024, CCB has more than 14,000 branches, serving more than 700 million individual customers and more than 9 million corporate customers, covering 31 countries and regions around the world. It is one of the banks with the largest assets and the strongest capital strength in the world.

(Figure 5.1)Display of some CCB honors

According to the 2022 to 2024annual report, in terms of organizational structure, CCB implements a three-level management structure of "head office-branch-sub-branch", and has a number of wholly-owned or controlled subsidiaries including CCB Financial Technology, CCB Financial Leasing, CCB Fund, and CCB Wealth Management, with businesses covering corporate finance, personal finance, asset management, international settlement, investment banking, financial leasing, insurance and financial technology services.



(Figure 5.2)CCB organizational chart

According to CCB's 2024 annual reports, its internal control objectives are clear, namely, to reasonably ensure legal and compliant operations, asset security, information authenticity, report integrity and business efficiency. The board of directors is responsible for building and supervising the internal control system, the senior management is specifically responsible for organizational leadership and daily operations, and the board of supervisors conducts supervision and evaluation. This institutional framework is highly consistent with the "five elements" structure of COSO, forming an internal control and compliance system covering the entire group and throughout the entire business process.

5.2 CCB's digital transformation process

According to 2022 annual report, CCB's digital transformation began in the "13th Five-Year Plan" period, and has formed a systematic promotion path since 2022. In terms of

IT systems, CCB has successively completed the centralization of core systems, channel system integration, data middle platform construction and "CCB Cloud" infrastructure layout. According to the 2024 annual report, in 2024, CCB will fully complete the switch of distributed core systems at home and abroad, and the distributed system will carry more than 94% of the bank's core transactions, marking its leap from centralized to cloud and distributed system architecture.

According to the annual reports of 2024, at the organizational level, CCB Financial Technology Co., Ltd. (hereinafter referred to as CCB Financial Technology), established in 2018, has become a key tool for promoting digital transformation. As the first financial technology company of a large state-owned bank, CCB Financial Technology takes "technology engine" and "ecological connection" as its strategic positioning, providing R&D support, product output and platform services. It has built a complete technology R&D system and continues to invest in AI, blockchain, cloud computing, big data and other fields. In 2024, it has obtained a total of 3,550 patent authorizations, including 2,438 invention patents, showing that it has significant capabilities in independent innovation in financial technology.

In terms of digital service channels, according to the 2023 annual report, CCB has built a service system with intelligent outlets, mobile terminals and remote services in parallel. As of the end of 2022, CCB has deployed more than 20,000 "Longyixing" mobile intelligent terminals, supporting more than 150 businesses such as door-to-door account opening and credit signing; the number of active mobile banking users exceeds 400 million, integrating government service functions such as social security and provident fund, and realizing one-stop handling of "finance + people's livelihood".

According to CCB's 2023 annual report, as of the end of 2023, intelligent voice navigation, AI customer service, video number services, etc. have achieved an average of tens of millions of customer interactions per day, and customer satisfaction continues to rise.

In terms of risk control and intelligent risk control, CCB 2023 annual report mentioned that CCB has built an AI platform covering voice recognition, knowledge graphs, image recognition, behavior analysis, etc., with a total of 43.3 billion service calls in 2023, and the results of the financial big model have been implemented in 193 business scenarios such as credit approval, risk warning, and financial analysis, significantly

improving risk control response capabilities and automation levels.

5.3 Achievements

Next, this study uses the COSO Framework as the evaluation framework, based on interviews with CCB employees and the financial reports of CCB in recent years, to observe and analyze the achievements and problems of China Construction Bank in the five aspects of control environment, risk assessment, control activities, information and communication mechanisms, and monitoring activities under digital transformation. The internal control system of China Construction Bank continues to strengthen its fit with the COSO framework, forming an internal control culture of "clear goals, clear responsibilities, and advanced tools". According to the annual report, CCB organizes internal control self-assessment and external audits across the bank every year. No major control deficiencies in financial or non-financial reporting have been found in the past three years, showing the robustness and adaptability of the internal control system.

5.3.1Control environment

According to the CCB 2024 annual report, the 2024 annual report shows that China Construction Bank has a complete corporate governance structure. The board of directors of CCB is responsible to the general meeting of shareholders, and it has strategic development, audit, risk management and other committees. The board of directors establishes and improves the internal control system in accordance with relevant requirements such as internal control standards, evaluates its effectiveness in accordance with regulations, and supervises the implementation of internal control-related activities. The Board of Supervisors is independent of the Board of Directors and is responsible to the shareholders' meeting. Senior management conducts their own business operations in accordance with the relevant articles of association of the bank and the authorization of the Board of Directors.

China Construction Bank's commitment to ethical values and integrity is closely centered on the themes of compliance and confidentiality. According to the interview Participant A indicated that CCB focuses on integrating "compliance culture" into strategic execution and strengthening employees' internal control awareness through digital training platforms, performance linkage and other mechanisms. According to the CCB 2024 Annual Report, the bank held more than 40,000 training sessions in 2023,

covering more than 2 million employees, effectively supporting the organization's transmission of risk control responsibilities. Participant G indicated that employees can find operation logs for all operations in the Construction Bank system, and the system will remember every step of the employee's operation, so employees cannot secretly tamper with the data; participant F indicated that all employees, regardless of their positions, must sign a customer information confidentiality agreement; tellers must inform customers of all information about their products before purchasing high-risk wealth management products, and the handling must submit "double recordings" before approval - audio and video recordings, otherwise they cannot be submitted for approval. These behaviors are precisely the embodiment of CCB's integrity and professional ethics.

In the interview of A and C, participant A pointed out, "The talent concept of CCB is to respect talents, make good use of talents, and retain talents", "In the digital transformation, the retention of technical talents is related to the lifeblood of our company's sustainable development", which coincides with the concept of organizations in the COSO Framework that they can attract, develop and retain talents. According to the CCB Annual Report 2024, CCB currently has a special technology talent training program-financial technology talent project, and has cultivated the first batch of new seedlings of financial technology talents; CCB has its own complete information technology management system and production safety guarantee system, equipped with a professional network security operation team, and established a research and development center that meets the needs of business development; In addition, participant C said that CCB will provide the most basic technical training for departments in traditional fields such as auditing to avoid problems such as inability to read data. It can be seen that CCB, in the context of digital transformation, attaches great importance to the training of scientific and technological talents, the construction of relevant technology infrastructure, and the training of employee technology.

According to interview, Participant A indicated that CCB accurately describes the job responsibilities of each position in the system, and absolutely does not allow overstepping of authority. Participant B said that in the era of digital transformation, every operation of CCB employees will leave a trace and be real-named, and the trace of employees' operations can be queried in the system. Each system will also set relevant responsible persons at key nodes; when a problem occurs, it can be traced back to all relevant responsible persons step by step. Participant F gave an example, "the

'green channel' for past loans is no longer feasible." He said that when a problem occurs, the relevant departments will hold all links accountable step by step in the order of handling, approval, and post-loan management. The refinement of job authority is also reflected in the authorization to query customer information. Participant B pointed out that except for account managers who can query customers assigned to their names, all inquiries to customer information must be authorized by the branch president.

5.3.2Risk Assessment

Compared with the traditional risk management model, the types of risks faced by CCB are more complex, showing digital characteristics represented by information technology risks, model risks and data compliance risks. According to the 2024 annual report, customer data leakage, system vulnerabilities, cyber attacks and other incidents constitute new threats to bank operations, and put forward higher requirements for information security and internal control; for this reason, CCB has established a model lifecycle management system and an independent review mechanism to improve the controllability and explainability of model risks. In addition, participant E indicated that with the widespread use of AI models in credit approval and risk pricing, potential problems such as algorithm bias, model aging, and black box decision-making have emerged, resulting in increased uncertainty in risk identification. It can be seen that with the deepening of digital transformation, China Construction Bank's risk assessment mechanism has undergone profound changes.

At the tool level, participant E also indicated that CCB introduced a model risk identification mechanism and an AI-assisted assessment platform to support the improvement of risk profiling, real-time warning, behavior prediction and other capabilities, and strengthen the breadth of identification of non-traditional risks (such as data leakage and model bias). CCB uses artificial intelligence and big data analysis technology, and through natural language processing and graph computing technology, it realizes automatic parsing of customer reports and identification of abnormal transaction behaviors, significantly improving the efficiency and breadth of assessment. According to the 2024 annual report, CCB has also built an enterprise-level model management platform to dynamically monitor the development, verification, launch and operation of risk models. At the same time, in order to cope with environmental and sustainable development-related risks, CCB has established an ESG risk stress testing system and incorporated climate scenario simulation into the overall risk assessment framework. Based on data visualization technology, CCB has built an

intelligent risk map and a bank-wide risk situation map to achieve multi-dimensional and cross-level dynamic risk monitoring. In addition, according to the interview feedback from participant A, CCB's audit and risk control departments have been equipped with advanced system tools for continuous monitoring of financial health and market trends. These tools can generate risk reports in real time to assist decision makers in formulating response strategies. Overall, digital means make CCB's risk assessment mechanism more forward-looking, intelligent and systematic.

5.3.3Control activities

Through the setting of automated control processes, CCB is committed to reducing the risks faced by activities that can achieve corporate goals to an acceptable level, that is, to intercept the identified risks as much as possible. Participant D indicated that the business that has become more complex in the context of digitalization can no longer rely on manual work at every step of the system. Participant G indicated that CCB's system has control points at each key step, and will provide operational prompts to employees when necessary. For example, the automatic limit set when opening a card, the inability of the loan approval system to upload blank materials, the red dots that appear when key information is not filled in, the safety operation prompts that pop up during employee irregular operations, and the user's birthday is automatically read by the ID card system. In the interview, Participant B indicated that for loan customers, the system will set multiple indicators to limit loan customers, including loan repayment ratio, number of overdrafts, card usage habits, number of credit checks, etc. If any indicator does not meet the standard, the system will automatically pop up a risk warning or directly refuse to submit for approval. At the same time, participant H indicated that each type of business system will have clear procedures set up, and all links will be completed according to the predetermined process and procedures.

The system must be transformed into action, not just talk on paper. According to the 2024 annual report, CCB not only has a complete information technology risk management system covering disaster preparedness, network security, information security, and system testing, but more importantly, it can implement the content of the system and continuously enhance the ability of safe operations and network security protection. In the interview, Participant A indicated that all important systems of CCB have completed off-site disaster preparedness and are ready for use. The company will regularly conduct practical exercises on security operations, continuously carry out penetration tests, orderly check security vulnerabilities across the group, and make rectifications. Actively respond to the requirements of regulators to carry out

ransomware emergency drills and network security attack and defense drills. CCB actively builds and promotes a comprehensive security testing management platform, comprehensively and routinely carries out automatic planning scanning security detection, and realizes online full life cycle management of security vulnerabilities. In addition, before all new systems go online, CCB will simultaneously release relevant system operation guides and update process manuals to let employees know more clearly how to operate. Participant C indicated that the execution of CCB's internal control is also reflected in the deep integration of its process control and system control. Relying on the internal control evaluation system and the business compliance platform, a digital control chain from "problem identification-system repair-rectification closed loop" is formed, which effectively improves the execution of the system and the consistency of control.

5.3.4Information and communication

In terms of information communication, in the interview participant A indicated that CCB has opened up internal and external data information channels, implemented a big data integration platform, supported regulatory reporting, operation monitoring and internal control decision-making, and improved information transparency and response speed. CCB pays attention to the accuracy of data and information that support the operation of internal control, and attaches great importance to the quality of data and information. When refer to information, participant D indicated that the data between mobile banking, core systems, customer management systems and other systems are completely consistent and updated synchronously. The data used has a traceable source, a traceable destination, and is compliant. CCB accesses data through legal channels such as user authorization and third parties, and records a series of information such as data source method and collection time. Participant G indicated that who has used, accessed, processed, and shared the data will be clearly recorded in the log, and necessary access control and compliance review will be implemented to ensure that "there is a come and go". In addition, according to the 2024 annual report, the data used in the AI financial big model are all the latest, compliant, and clean, and there will be no situation where old data is used to deal with new market analysis. The whole bank carries out data quality testing, self-inspection and inspection are carried out in parallel, and it is fully capable of monitoring data quality online, co-checking data problems, and repairing data that needs rectification. In addition, the accuracy of CCB information has been improved in the context of digital transformation, which is also reflected in the merging of customer identity information. Participant F indicated that in the past, due to the limitations of the system, it was often the case that the same person had

multiple IDs. This is because the previous system was not smart enough. When customers were young, they opened accounts with their household registration books, but opened accounts again with their ID cards after they became adults, or because they opened accounts with their former names. Participant F also replied that the new generation of systems will number users according to a specific mechanism. The system can not only automatically identify multiple IDs of users in the system, pop up windows in time, and force the merging of files, but also avoid such situations for new users.

CCB internal communication effectively supports the operation of internal control. Participant E indicated that CCB has created an exclusive APP for CCB employees to ensure smooth communication between departments, between superiors and subordinates, and between employees within the bank. CCB's own employee-exclusive APP - CCB Employees, can be called the exclusive "WeChat" for CCB employees. Employees can find all the information of any employee in the bank in this APP and contact them. However, the functions of this APP are far more than that. Participant H responded that it can also hold online meetings, upload approval documents, receive internal emails, rectify problems, etc. It is an important office software for CCB employees to handle all kinds of work matters. This software breaks the communication barriers between employees in CCB in time and space, and is both compliant and convenient. In addition, the smoothness of CCB's internal communication is also reflected in the employees' reporting of abnormalities. Participant F responded that when employees find suspicious situations, such as customers suspected of fraud, they will choose to actively report rather than deliberately conceal them. This is actually related to the company's incentive mechanism.

According to the interview A and C, A pointed out that the communication between CCB and the outside will have an important impact on CCB's internal control. The smoothness of CCB's communication with the outside world is reflected in the three aspects of reporting data to the regulatory authorities, providing product risk warnings to customers, and sharing data with third-party platforms. In terms of communication with regulatory authorities, participant C indicated that CCB's regulatory department will regularly submit a series of compliance materials according to the requirements of the regulatory authorities and report the latest trends of corporate compliance to the regulatory authorities; risk events will be reported to the regulatory authorities in a timely manner; actively respond to compliance inspections by regulatory authorities, and establish a liaison mechanism with regulatory authorities through regular meetings.

In terms of communication with customers, participant H replied that all customers who purchase wealth management products must sign the "Product Manual", "Risk Warning Book" and "Disclaimer"; wealth management customers over the age of 65 are required to sign an additional "Insurance Statement" to reiterate; in addition, participant B pointed out that account managers are not allowed to use the word "capital protection" in their promotions, and all telephone marketing will be recorded and archived. In terms of cooperation with third-party platforms, such as WeChat authorization of credit card repayment, checking this month's bill, setting a repayment date, etc., CCB will first obtain the customer's consent and require the customer to sign an authorization letter.

5.3.5Monitoring activities

In the process of digital transformation, CCB has strengthened the deployment of intelligent monitoring systems. According to the interview, Participant A indicated that the internal audit department of CCB implements vertical management, and the audit work covers the entire bank and its subsidiaries. It also uses digital audit tools and risk map technology to improve the audit depth and coverage, and realize the combination of real-time and accuracy of audit. Participant B said that the system will also monitor key indicators such as transaction delays, customer complaints, and abuse of authority in real time. Once a problem occurs in a certain aspect, a work order, prompt or alarm will be issued in time, and relevant personnel can see it.

Participant E pointed out that CCB's mobile banking has a stronger risk sensitivity than other banks' mobile banking. For example, as long as the mobile banking login exceeds a period of time or switches to the background, the user will be required to re-enter the account password. In addition, participant G pointed out that all CCB systems have automatic monitoring modules to remind employees of abnormal transactions, process timeouts, etc. The system will conduct a full closed-loop monitoring of the business, and all people who have clicked, approved, and processed will be recorded in the system to achieve comprehensive monitoring.

In the interview, Participant C revealed that after the problem is discovered, the error can be corrected in time, which enables CCB's internal control to achieve good results. Participant C said that CCB under digital transformation has stricter compliance requirements for rectification tasks. Participant G pointed out that the order of rectification should be determined according to the severity of the rectification issues, so that important things will not be buried. After the rectification is completed, it is necessary to take a screenshot of the system, fill in the rectification form, and send it to

the superior together with the training records, modified rules, etc. as evidence, by email or internal APP. Participant C also indicated that for some more important errors involving misrecording of information, a rectification deadline will be set. If the rectification is not completed as expected, it will be upgraded and the relevant responsible person will be deducted points.

5.4 Existing Problems

5.4.1Control Environment

Although CCB has a complete governance structure, it does not highlight the importance of technology and IT. According to the 2024 annual report, it did not set up a special technology risk committee under the board of directors, but generally classified technology-related issues under the risk management committee; secondly, among all the directors of CCB, most of them have relevant academic backgrounds such as economics and business administration, and it did not allow people who understand technology, are familiar with big data, and network security to enter the board of directors. In addition, participant E revealed that the promotion path of technical personnel among bank employees is difficult. Technical personnel stay in a position for decades and it is almost difficult to be promoted to management positions. Lack of promotion channels technical employees change jobs after working for a few years, and enterprises cannot retain technical talents. This also brings about a situation where the technical department has the final say on any technical issues. Participant D revealed that most of the training and examinations are just formalities, and the answers and questions have been received by employees before the exam, and many of them just don't really understand them.

5.4.2Risk Assessment

In the interview, B revealed that CCB relies heavily on AI and big data models for risk identification and credit assessment. According to the 2024 annual report, although it has established a model life cycle management mechanism, the annual report also indicates that the decline in model applicability, algorithm bias and "black box" problems are still difficult to completely avoid. This may lead to distortion or misjudgment of risk identification. At the same time, participant A pointed out in the interview that in the face of new risks such as climate change, ESG, and cybersecurity, CCB's risk control mechanism is still in its infancy and has not yet fully matured, so its assessment results still have limited guiding role in business decision-making. At the

same time, participant B revealed that as the risk assessment system increasingly relies on automated tools, whether employees have sufficient model understanding and risk judgment capabilities is a very important issue, especially for grassroots and front-line employees.

5.4.3Control activities

Although CCB already has a complete disaster preparedness system, the system still has certain security risks. First, participant C indicated in the interview that in recent years, CCB has experienced several complete system crashes, the most serious of which lasted for more than an hour. Secondly, participant D pointed out that CCB mailboxes often receive dangerous phishing emails. Although the technology department will regularly notify employees to pay attention and make rectifications, such problems cannot be eliminated. Moreover, the system occasionally freezes when in use. In addition, participant B revealed in the interview that non-technical department personnel are not familiar with the backup server, and often cannot find the backup server after the system crashes, and finally have to find the technology department for help.

The bank also needs to improve the process design of the operating system. Although the design of its system is compliant, it does not conform to the habits of front-line employees. Participant G indicated that the same customer of the account manager is in different systems, and the same information can be copied and pasted in one system, but not in another system. The account manager often needs to log in to another system again and perform a complex operation before copying the information. This brings a lot of inconvenience to account managers who need to keep accounts, maintain customer relationships, and track customer situations, which is not conducive to improving work efficiency.

Finally, participate H indicated that there are certain problems with the implementation of systems and new regulations. Most front-line employees mainly rely on supervisors to notify and explain to understand system updates and system changes. In many cases, despite the updated system, some front-line employees will still follow the old process, which brings unchanged to customers and the employees' own work does not meet the standards.

5.4.4Information and Communication

In the communication between departments, there are occasionally disagreements and disputes due to different goals pursued by each department. Participant B pointed out that during the bank's card-cutting operation, the compliance department adhered to the principle of risk prudence of its own department and believed that debit cards should be opened less and risks should be avoided as much as possible; while the business department believed that debit cards should be opened as much as possible in order to meet its own performance indicators. Disputes often arise between the two departments because of this contradiction. This is ultimately due to problems in communication between departments. At the same time, participant D indicated that many policy updates are mainly just a document, without additional training, video explanations, or testing of the updated content. In many cases, even if the system or process has changed, employees do not notice it at all. In terms of communication with customers, participant H mentioned that although banks will sign relevant risk instructions before customers purchase wealth management products in accordance with regulatory and compliance requirements, those risk warnings are often hidden in small print and difficult for customers to notice. In terms of communication with regulatory authorities, participant C indicated that the situation of "first post and then supplement" of reported content often occurs, that is, first report according to the routine, and then go back to modify the wrong content or data when there is a problem.

For external information connected to the system, there are often problems such as delayed updates or inaccuracies. Participant F mentioned that the "new generation system" specially used to help customers handle business will be connected with the customer loan information and credit information of all external banks to calculate the customer's loan ratio on all banks. However, this loan ratio is sometimes not accurate, and the data of the total loan amount often lags or is wrong due to different repayment time and repayment method.

5.4.5Monitoring activities

In terms of rectification, participant D mentioned that for some unimportant and non-urgent rectifications, such as clothing and object placement issues, there will be situations where employees only reply but do not make changes, that is, after receiving the rectification email and simply replying "received", the matter is left unresolved. On the one hand, this is because there are certain loopholes in the rectification implementation mechanism, and on the other hand, it is also a kind of resistance of

employees to the overly inhumane rectification content. Participant G mentioned an example in the interview. The CCB system requires male employees to button their shirts to the top of their necks. However, some male employees have thick necks, so buttoning is not only uncomfortable, but also affects their work. There is often a situation of "passing the buck" between the people responsible for rectification, and no one wants to implement it. For example, when a branch encounters a customer complaint, the supervisor and the president often shirk responsibility. The supervisor believes that it is more appropriate to let the president handle this matter, while the president believes that such matters should be mainly handled by the supervisor. Participant C pointed out that this problem is generally caused by changes in the system and different understandings of the system by employees. The previous CCB system clearly required that customer complaints be handled by the branch president, but the changed system has become a supervisor-led and jointly handled with the president. When dealing with some outsourcing issues or problems in public welfare affairs, banks often lack the motivation to solve them, resulting in the inability to completely solve the small tail of the problem. Participant F indicated that CCB's social security card business is mainly carried out to shoulder the country's social responsibility. This business is a public welfare affair and does not help much in the growth of operating income, so employees are not very motivated to deal with related issues. The machines for processing social security cards are purchased from outsourced vendors. The relevant departments did not strictly screen these machines when purchasing them. The purchased social security machines are easily broken, resulting in the problem that it takes more than an hour to activate a social security card. In terms of regular inspections, participant E indicated that some random inspection mechanisms, such as annual inspections and checking ledgers, will become a formality. They just read out the content of the system without understanding it and conduct mechanical inspections without knowing what the key content is.

6. Discussion

This section focuses on the five internal control elements of the COSO Framework, analyzes how China Construction Bank (CCB) promotes the systematic reconstruction of its internal control system through digital control activities during its digital transformation, and provides theoretical explanations in combination with Agency Theory.

6.1 Reshaping of China Construction Bank by Digital Control Activities

This summary discusses the sub-issue of how digital control activities reshape China Construction Bank's internal control practices in terms of control environment, control activities, information communication, risk assessment and monitoring mechanisms. The results obtained from the internal control of CCB confirm the conclusion of most studies that "digital transformation has a significant role in promoting the improvement and enhancement of internal control of enterprises." (Oluwagbemi et al. 2011; Xiong & Guo, 2024; Qin, 2024; Wang et al. 2023)

6.1.1Control Environment

CCB sets up a clear governance structure through the decentralization of the board of directors, the board of supervisors and senior executives, and grants power to different departments according to their functions. This verifies the content expressed by Shleifer & Vishny (1997) that a sound governance structure and a sound information mechanism can strengthen investors' control and constraints on management. As Deumes & Knechel (2008) emphasize, managers have an incentive to spend resources on monitoring to reduce the efficiency losses of agency problems. CCB has reflected this theoretical expectation by establishing a sound governance structure and large-scale digital training, that is, providing management with more reliable information through internal control systems to reduce agency conflicts. It also verifies Fama & Jensen (1983b)'s exploration of granting different agents for initiation, approval, execution and supervision from the perspective of "institutionalized contract system" can effectively avoid the agency problem caused by insider control. CCB separates ownership and control by establishing a board of directors and senior management respectively, and establishes a special audit department under the board of directors to supervise the behavior of senior management, which reflects. Fama & Jensen (1983b) said that in modern large enterprises, the separation of ownership and control is crucial.

In addition, if employees lack a full understanding of the system or data mechanism they use, they may encounter "cognitive agency problems" due to operational errors such as judgment bias and system misuse. (Jensen & Meckling, 1976) Therefore, CCB responded to this problem through the concept of "respecting talents, using talents well, and retaining talents" mentioned by participant A and the establishment of the "financial technology talent project". Fama (1980)'s "information structure empowerment" shows that organizations can establish information access mechanisms to enable agents to make rational choices based on sufficient information. CCB alleviates cognitive discontinuity through a large number of organizational learning mechanisms such as digital training, which improves employees' ability to operate complex systems, that is, enables employees to make rational operational behaviors when using the system.

The constraints on the formulation and verification of compliance systems are ultimately to achieve employees' recognition of the company's internal culture. Fama & Jensen (1983b) believe that cultural control is an informal mechanism with low supervision costs but relying on the long-term role of the institutional environment, while Eisenhardt (1989) stated that transforming organizational norms into the agent's own values is the most sustainable way of governance. CCB promotes the transformation of the system from employee behavior to its own values through the following activities. CCB embeds the culture of compliance and integrity into each operating system. CCB builds a behavioral constraint system based on responsibility traces through operation log records, "double recording" mandatory mechanism, unified confidentiality agreement, and employee behavior visualization. This can not only effectively reduce the moral risks of employees, but also allow employees to gradually move closer to the system in the process of "being supervised". The system builds a bridge between behavioral constraints and cultural formation.

Based on Schein's (1983) Embedding Mechanisms theory, CCB has achieved deep culturalization of the system through digital means. CCB has internalized the compliance system into the code of conduct for employees through large-scale digital training (the annual report shows that the bank held more than 40,000 training sessions in 2023, covering more than 2 million employees), embedded operation guidance in the system (such as key step control points and operation prompts mentioned by participant G), and behavior visualization (operation log records, real-name traces). As Bozkus (2023) pointed out, modern digital systems standardize the language, processes and

expectations among organizational members. CCB's unified digital platform has indeed formed an embedded value-oriented system, effectively reducing cognitive agency costs.

In the context of digital transformation, the standardized operating procedures and unified terminology system of modern information systems reduce subjective bias and unclear responsibilities. (Shaban & Omoush, 2025) Once the operating procedures are embedded in the system, the system will become standardized and the division of responsibilities will become clear. Because any set task initiation, approval and archiving, etc., will clearly define the specific person in charge within the system to prevent mutual shirking of responsibilities. These information systems can help organizations unify the boundaries of responsibilities for different positions and levels, effectively reducing agency problems caused by poor communication or unclear authority (Bozkus, 2023). The interview content of CCB is highly consistent with this. Participant A pointed out that CCB has a clear division of responsibilities for each position and strictly prohibits overstepping authority; Participant B mentioned that each employee's operation has a system trace and can trace the person responsible. For example, in the loan process, once a problem occurs, it will be held accountable layer by layer in the order of handling, approval, and post-loan management. In addition, there are strict permissions for access to customer information, and it cannot be viewed without authorization. These mechanisms all reflect the emphasis in agency theory on reducing agency costs by clarifying responsibilities, improving process transparency, and reducing the space for autonomous decision-making (Jensen & Meckling, 1976; Fama & Jensen, 1983a,1983b).

6.1.2Risk Assessment

Analyzing CCB's achievements in Risk Assessment from the perspective of agency theory, Shleifer & Vishny (1997) believe that in an environment where supervision is not fully implemented, management may hide risks or selectively disclose them, but this potential risk problem can be solved through a technology-assisted risk identification system. CCB has formed an intelligent closed loop from identification to early warning by building risk identification systems such as AI-assisted risk identification, ESG stress testing, and graph computing to identify abnormal behaviors, thereby improving managers' ability to discover and predict risks in a timely manner. At the same time, CCB has demonstrated that enterprises can identify non-traditional risks in real time through AI, big data, and graph analysis tools, improve assessment

efficiency, and reflect the evolution of risk management from "static compliance to dynamic prediction". At the same time, this also verifies the conclusion that enterprises use AI technology for dynamic prediction to improve decision-making mechanisms (Oluwagbemi et al. 2011; Hao, 2025), and also illustrates the applicability of the view of Chinese manufacturing companies that "digitalization has accelerated the intelligent process of risk assessment" to CCB, a commercial bank. (Ouyang, 2025).

6.1.3Control Activities

Fama & Jensen (1983a,1983b) advocated that institutionalized key control activities can help regulate agent behavior and avoid opportunistic operations. Fama & Jensen (1983a, 1983b) believed that embedding tasks into the system would make it unnecessary to rely entirely on the trust mechanism. CCB improves the standardization and uniformity of processes and operations by using full-population testing and process embedding technologies such as AI approval, intelligent prompts, automated control points, and system embedded processes ,such as red dot marking of approval standards, interception of rejected materials, etc., thereby completing the automatic compliance of process execution, avoiding dependence on trust mechanisms, that is, individual judgment, and greatly reducing internal manipulation space and fraud risks. This not only verifies what Li (2025) said about Chinese companies achieving process embedding and node warnings through information systems, thereby identifying and controlling risks in the process of handling business and approval; it also reflects the control concept of "real-time intervention" in the context of digital transformation of Chinese companies. (Zou, 2025) CCB’s automated control activities also fully confirm Deumes & Knechel’s (2008) view that internal control as a supervisory mechanism reduces the efficiency loss of agency conflicts. Through system-embedded control points and automated approval processes, CCB achieves the goal of the internal control system to provide management with more reliable information and mitigates the threat of providing unreliable information to investors.

Bozkus (2023) pointed out that modern digital systems can effectively reduce gray space and the possibility of shirking responsibility through standardized process design. CCB's practice of clarifying the responsible person by setting task processes and system traceability mechanisms is a typical embodiment of this theory. Participant G mentioned that "the system sets control points at each key step and provides operation prompts to employees when necessary", and participant H described that "each type of business system has clear procedures set up inside, and all links are completed

according to the predetermined process", which shows that CCB has achieved the "task process standardization and responsibility clarification" emphasized by Bozkus (2023) through digital means. This systematic process embedding not only improves the execution efficiency of control activities, but more importantly, reduces the randomness and uncertainty of human operations through technical constraints.

A sound system design is only one aspect that affects its effectiveness. The key lies in whether it can be implemented and embedded in the daily behavior of employees (Jensen & Meckling, 1976; Fama & Jensen, 1983a). CCB transforms the security management system into actionable behaviors through digital means, such as conducting penetration tests, actively responding to the requirements of regulators to conduct extortion emergency drills and network security attack and defense drills, etc. to reduce the possibility of "lack of supervision" and "moral hazard".

In addition, with the help of the system online simultaneous release of operation manuals and the mechanism of automatic repair of problems on the business platform, CCB deeply embeds process control into the IT system, realizing the agency behavior. Enterprises should not rely on external supervision, but should use embedded systems or rules and regulations to achieve behavior constraints and efficient operation of enterprises. (Fama,1980; Eisenhardt, 1989) The whole process management of problem identification-rectification closed loop also compresses the agent's fuzzy operation space, enhances the coercive force and consistency of the system, and truly implements the system into action. This also verifies Tan, (2025) that Chinese companies are currently generally building a "system + rules" responsibility chain control mechanism through digital upgrades, which is one of the major changes in China's internal control paradigm.

6.1.4Information & Communication

In terms of information communication, Jensen and Meckling (1976) pointed out that a core source of agency costs is information asymmetry. Fama and Jensen (1983a, 1983b) further emphasized that organizations should have mechanisms to ensure that management does not conceal unfavorable information and can promptly transmit it to the board of directors and shareholders.

Under this theoretical framework, CCB strives to achieve information sharing and efficient transmission through a unified data platform, cross-system data consistency, and the "CCB Employees" APP, while ensuring that the communication mechanism with regulators, customers, and third parties is compliant and transparent. These practices have reduced the agency costs caused by information asymmetry to a certain extent. Bozkus (2023) pointed out that a unified digital platform can reduce the understanding deviation between different levels and positions through process, terminology, and role standardization, and also become a bridge for cross-level communication and coordination. From this perspective, CCB's "CCB Employees" APP is the practical application of this theory. Through standardized operating interfaces, unified business processes, and standardized communication languages, it reduces the information understanding errors between departments and levels.

This increase in information transparency, as discussed by Deumes and Knechel (2008), helps reduce capital costs through internal control reporting mechanisms. From the perspective of agency theory, reducing information asymmetry helps reduce investors' uncertainty about future earnings forecasts, thereby reducing their risk expectations. CCB's new generation system solves the problem of duplicate user files in the old system, demonstrating the unique exploration of Chinese companies in digital internal control of "system + rules + coding" (Li, 2025). Through unified identity rules (such as mandatory file merging) and standard coding mechanisms, CCB has achieved the standardization of user identity management, aiming to reduce transaction errors, control risks and improve data sharing efficiency. This practice reflects the unique internal control mechanism design of Chinese companies in the face of small, high-frequency, and regionally dispersed transactions.

From the perspective of external communication, the communication between organizations and external entities is essentially an act of reducing information asymmetry and moral hazard (Jensen & Meckling, 1976). In its communication with regulators, CCB strives to consolidate reporting responsibilities and reduce employees' room for maneuver in choosing the timing of reporting through regular data reporting and emergency risk reporting mechanisms, which is in line with Fama and Jensen's (1983b) theory that "effective supervision can compress residual losses". The digital ability to fulfill responsibilities through regular information updates under digital systems is also a continuation of Fama's (1980) governance idea of "self-enforcing mechanisms".

In terms of customer communication, CCB forces customers to sign product risk warnings and sets up automatic reminder mechanisms for elderly customers, which is consistent with Eisenhardt's (1989) view that "behavioral control is applicable to highly programmed compliance tasks". At the same time, by prohibiting the use of "guaranteed principal" and other rhetoric, automatically recording and archiving all telephone marketing processes, CCB prevents account managers from selectively transmitting information.

In cooperation with third-party platforms, CCB requires customers to sign digital authorization letters, which aims to strengthen customer privacy and data security through prior authorization and traceability mechanisms. From the perspective of agency theory (Jensen & Meckling, 1976), this approach is a response to the division of power and responsibility in multi-agent relationships in the context of modern digital governance.

6.1.5Monitoring Activities

Fama & Jensen (1983b) stated that continuous monitoring can reduce the probability of deviant behavior and improve the effectiveness of the accountability mechanism. It can be said that continuous monitoring is the core of agency cost control. CCB realizes intelligent monitoring deployment through digital audit tools, risk control maps, full-process log records and system warnings, builds a systematic, automated and real-time monitoring closed loop, and strengthens the constraints on agent behavior.

In summary, the case of CCB has indeed verified that digital transformation reduces human operational errors and information input errors, making the operation of enterprises more formal and standardized, reducing the agency costs of enterprises and improving the quality of internal control. (Oluwagbemi et al. 2011) However, due to the lack of relevant survey results and the limitation of the number of cases, the series of contents such as the influence of manager characteristics have not been verified. Moreover, since this study did not conduct a comparative study with the manufacturing industry and non-state-owned enterprises, the transformation effect of state-owned enterprises is better than that of non-state-owned enterprises, and non-manufacturing is better than that of manufacturing. This study cannot be verified.

6.2 Challenges faced by CCB internal control in the context of digital transformation

This summary discusses the internal control challenges currently faced by China Construction Bank in digital transformation and how these challenges affect its compliance and operational efficiency.

In terms of the control environment, CCB faces two major problems， "technical power vacuum" and "reverse incentive". On the one hand, although CCB has established a sound governance structure, its board of directors lacks members with a scientific and technological background, and has not set up a special committee for scientific and technological risks, indicating that the organizational level does not pay enough attention to the institutionalization of technical issues, which represents a typical agency risk stemming from the absence of institutionalized professional oversight in scientific and technological governance (Fama & Jensen, 1983b). At the same time, it also verifies to a certain extent the view in pan-enterprise research that digital transformation makes the internal governance of enterprises more complicated and the internal governance structure cannot keep up. (ECLAC, 2024; Hao, 2025) On the other hand, the lack of a reasonable incentive path for key professional groups (such as technical personnel) will cause agents to lose their willingness to invest in the long term and tend to engage in some short-term oriented opportunistic behaviors. (Jensen & Meckling, 1976). Eisenhardt (1989) also pointed out the incentive distortion problem caused by unbalanced contracts. It is difficult for technical personnel in CCB to be promoted and lack career advancement space. The choice of job hopping or slacking off is precisely because of the agency problem caused by the inadequate incentive setting path. In addition, the fact that frontline employees only take system training and examinations for formalities also reflects the "cultural supervision failure" emphasized by Fama (1980) at the organizational culture level (Fama, 1980), which increases the non-explicit agency costs. Employees completely rely on technical personnel after problems with the system, which verifies the conclusion of the pan-enterprise research that there is a large gap in digital literacy among employees. (Oluwagbemi et al. 2011; Hao, 2025)

In terms of risk assessment, CCB faces two major challenges: "technical black box" and "cognitive rupture". CCB relies heavily on AI and big data models for risk assessment. Although it has established a model life cycle mechanism, it still faces problems such as algorithm bias and reduced model applicability, which is highly consistent with the "outsourcing of control to an opaque mechanism" described by Fama & Jensen (1983a). This black box agency problem means that due to the agent's use of the algorithm, the principal cannot effectively supervise and judge its internal operation process. In addition, employees' weak understanding of the model mechanism also exposes the organization's shortcomings in "information empowerment", which can easily make some control mechanisms ineffective. Jensen & Meckling(1976)pointed out that when agents rely on complex tools in decision-making but lack sufficient understanding, "cognitive moral hazard" is very likely to occur, making the risk control process ineffective. In particular, the risk control mechanism for new risks such as ESG and climate change is still in its infancy. The gap between the technical evaluation system and the real business risk is what Shleifer & Vishny (1997) referred to as "institutional control lag", which will also lead to the problem of control vacuum (Lv & An, 2025). At the same time, this also verifies the view that the backwardness of the internal control system will bring risks and crises to the enterprise. (ECLAC, 2024; Hao, 2025) From the perspective of Bozkus (2023), the poor understanding of AI model mechanisms by CCB employees reflects the failure of organizations to adequately invest in skills development and training during digital transformation. Bozkus (2023) emphasizes that individual resistance to change and skills gaps hinder the successful implementation of technological innovation, which increases the cognitive agency costs of risk assessment.

In terms of control activities, CCB's internal control system mainly faces two major problems: "system mismatch" and "process friction". Although the bank has established a disaster recovery mechanism and a basic IT control framework, the system frequently experiences downtime, freezes, and phishing attacks, indicating that its digital control activities have obvious shortcomings in terms of technical flexibility and security, resulting in insufficient overall system stability. From the perspective of agency theory, when the organizational control environment is unstable or lacks credibility, agents are more likely to engage in opportunistic behaviors such as evading responsibility and reducing compliance investment (Jensen & Meckling, 1976). In addition, the cumbersome system operation, the lack of interconnection between systems, and the disconnect between system updates and front-line employees' understanding indicate that CCB's system design is not truly user-centric. This misalignment between technical design and employee usage capabilities may lead to "behavioral distortion", that is, employees passively deviate from the compliance path due to operational obstacles

(Eisenhardt, 1989). The phenomenon that employees still rely on old process operations when the system has been updated also reflects the organization's lag in learning and adaptation mechanisms, weakening the actual execution of control activities. According to the digital transformation stage theory proposed by Bozkus (2023), CCB's current problems are mainly concentrated in the "deployment stage" and the "optimization stage": in the deployment stage, the promotion path for technical personnel is unclear and the training is perfunctory, which leads to employees' resistance to job changes that may be brought about by new technologies; in the optimization stage, the system operation is unstable and cross-system operations are cumbersome, which exposes the lack of balance between leveraging the advantages of existing technologies and maintaining technological adaptability.

In terms of information and communication, CCB faces the problems of "internal goal conflict" and "upstream and downstream information disconnection". According to the agency theory of Jensen and Meckling (1976), different agents within an organization may pursue inconsistent goals. If there is a lack of an effective coordination mechanism, the agency cost will rise. In CCB, there are differences between the compliance department and the business department in the control and development goals, which are manifested as delays and deviations in policy implementation, which is a typical "goal-inconsistent agency problem".

In addition, CCB's information transmission method is still mainly written notification, lacking the necessary feedback mechanism and targeted training. This one-way communication method is likely to cause grassroots employees to have unclear understanding of the system and inadequate implementation. This situation fails to reflect the organizational contract design principle of "reducing agency risk through information sharing" emphasized by Eisenhardt (1989). Establishing an effective information sharing mechanism in the organization will help alleviate the agency risk caused by information asymmetry. However, the current communication model fails to fully play this role.

In the context of digital transformation, Bozkus (2023) pointed out that successful transformation not only depends on the deployment of technical tools, but also requires the reshaping of the organization's collaborative culture and authorization mechanism. CCB has achieved a certain degree of information integration and departmental linkage through the "Employee Communication" APP, which reflects the potential of digital tools in supporting communication. However, according to the interviews, conflicts

between different departments still exist, reflecting that in the process of transitioning from the traditional vertical command system to the collaborative decision-making mechanism, the organization still faces deep-seated problems such as unclear responsibilities, path dependence and transformation resistance.

In monitoring activities, CCB faces the challenges of "incentive misalignment" and "institutional ambiguity". The difficulty in implementing the rectification mechanism, employees shirking responsibilities, and the passive response of public welfare businesses indicate that there are still problems with the accountability system and monitoring mechanism incentive mechanism of CCB's monitoring activities. Fama and Jensen (1983b) believed that without a sound supervision and accountability mechanism, agents may generally adopt "selective response", which will have a negative impact on the effectiveness of organizational governance. Mechanical inspection and rectification lacks humanitarian care, which has brought negative emotions to employees and even caused great negative impacts, indicating that the governance structure of CCB has failed to achieve the unity of behavioral control and value recognition, which also violates the "behavioral contract acceptability principle" advocated by Eisenhardt (1989). In response to the problem of poor management of outsourced equipment such as social security card machines, Shleifer & Vishny (1997) argued that companies often lack the enthusiasm for governance of low-profit tasks. This "institutional vacuum" just exposes the loopholes and deficiencies in the organization's internal control. The various strict rules and regulations and the need to connect with multiple regulatory bodies in the CCB case also indirectly verify the typical characteristics of Chinese state-owned enterprises in the context of "state-owned enterprise governance structure" described by Lv & An (2025), such as heavy compliance pressure within the system, and the view that state-owned enterprises will face stricter compliance requirements and policy supervision and require highly standardized internal control structures in the process of promoting digital transformation.

In addition, the talent structure of enterprises after transformation does not match the actual needs. Since CCB did not disclose relevant information during the interview, this conclusion cannot be verified. Regarding the view that the weak interoperability between various systems is not conducive to information communication (ECLAC, 2024), CCB has confirmed this conclusion from the opposite side, because the information between various systems within CCB is completely shared and consistent, so its internal communication is smooth. Regarding whether the digitalization of the internal control system of Chinese enterprises in the context of digitalization is through

the path of "easy first, difficult later, financial first, business later" (Li, 2025), since this study mainly discusses the performance of CCB's internal control after digital transformation, the order of its transformation process is not within the scope of this study interview.

From the perspective of Deumes & Knechel (2008)'s agency theory, the challenges faced by CCB reflect the complexity of agency cost control. The conflict of goals between departments mentioned by participant B confirms the difficulty of coordinating the interests of all parties when there are multiple agency relationships in an organization. Although Deumes & Knechel (2008) emphasize that internal control can reduce agency costs by providing more reliable information, the case of CCB shows that the effect of reducing agency costs depends largely on the rationality of system design and the supporting improvement of organizational incentive mechanisms.

6.3Limitation and Future Research

Although this study systematically analyzes the internal control practices of CCB in the context of digitalization, it still has certain limitations. First, the research subjects are limited to China Construction Bank, and there is a lack of horizontal comparison with other enterprises in the same region, different countries, different regions, and different fields. There are also many banks of different natures and sizes in China, and this case study also lacks horizontal comparisons of different types of banks in the same region. Secondly, although the eight participants are representative, there are only eight participants, and each person may be affected by his or her own subjective experience. Therefore, the representativeness of this case has certain limitations. In addition, the research method is mainly based on literature analysis and case interpretation, lacks empirical data support, and has not yet conducted a quantitative test on the relationship between digital investment and internal control performance. Finally, due to the time limit of the interviews conducted in the case study, it was not possible to involve a large range of people and more people in this study.

Based on the above limitations, future research can be further expanded in two directions: first, increase the number of samples, conduct comparative analysis of multiple banks, multiple formats, and multiple people, and improve the universality and comparative value of the conclusions; second, introduce empirical analysis methods,

combine questionnaires, performance indicators or text mining tools, build data models, and more scientifically evaluate the impact of digital transformation on internal control quality, providing quantitative support for management practice.

7.Conclusion

This paper takes China Construction Bank as the case study object and uses the agency theory under the COSO internal control framework. Through the theoretical perspectives of agency theory and the COSO framework, this study systematically explores the impact of digital transformation on the internal control system of China Construction Bank. Research has found that digital technology has significantly optimized the real-time and refined level of CCB's internal control by reconfiguring control processes, enhancing information transparency, and improving the efficiency of risk prevention and control. However, it has also brought new challenges such as technology dependence and data security.

Digital transformation has significantly enhanced the internal control efficiency and quality of China Construction Bank. In terms of the internal control environment, digital transformation has strengthened the governance structure of the Construction Bank through clearer role definitions and embedded compliance mechanisms. In terms of risk identification and assessment, the application of artificial intelligence platforms and big data technologies has enhanced the response speed of risk early warning, and the coverage has expanded from traditional credit risks to emerging fields such as cyber security and model bias, making risk identification more dynamic and comprehensive. In internal control activities, the deployment of automated processes (such as the restrictions of multiple indicators in the loan approval system) has reduced human intervention and achieved the pre-interception of risks. In terms of information communication, the construction of the data center and the establishment of the bank-wide risk map have ensured the real-time and consistency of information. The promotion of the internal dedicated APP has broken down the communication barriers between departments. In addition, the comprehensive coverage of intelligent monitoring systems such as the risk sensitivity mechanism of mobile banking has enhanced the dynamic supervision capacity of internal control.

However, this article finds that CCB also has deficiencies in its digital transformation. For instance, as mentioned above, there are still problems with information communication among departments. Excessive reliance on digital-driven and big data creates potential "black box" risks. System vulnerabilities and cumbersome ports; There are significant differences in the digital technology proficiency of employees, etc.

For CCB, digital transformation is not only an opportunity for change but also a complex challenge. To carry out digital transformation more successfully, continuous innovation is needed in aspects such as technical governance structure, human

resource strategy and regulatory framework. Digital transformation is never a task that can be accomplished overnight; it requires continuous attention and adjustment from the company.

Reference

Alles, M.G., Brennan, G., Kogan, A. and Vasarhelyi, M.A., 2006. Continuous monitoring of business process controls: A pilot implementation of a continuous auditing system at Siemens. *International Journal of Accounting Information Systems*, 7(2), pp.137–161.

Alvesson, M. and Deetz, S., 2000. Doing Critical Management Research. London: Sage Publications.

Boot, A., Hoffmann, P., Laeven, L. and Ratnovski, L. (2021) The future of banking: From scale & scope economies to fintech ecosystems. Washington, DC: International Monetary Fund.

Bryman, A. and Bell, E., 2015. Business Research Methods. 4th ed. Oxford: Oxford University Press.

Bozkus, K., 2023. Organizational culture change and technology: Navigating the digital transformation. *In: Organizational Culture - Cultural Change and Technology*. IntechOpen.

Brynjolfsson, E. and McAfee, A., 2014. The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies. New York: W.W. Norton & Company.

China Construction Bank Corporation (CCB) (2022) Annual report 2022.

China Construction Bank Corporation (CCB) (2023) Annual report 2023.

China Construction Bank Corporation (CCB) (2024) Annual report 2024.

Committee of Sponsoring Organizations of the Treadway Commission (COSO), 1992. *Internal control – integrated framework: Executive summary*. American

Institute of Certified Public Accountants.

Committee of Sponsoring Organizations of the Treadway Commission (COSO), 2013. *Internal control – integrated framework: Executive summary*. American Institute of Certified Public Accountants.

China Banking Regulatory Commission, 2014. *Guidelines on Internal Control of Commercial Banks*. Yin Jian Fa [2014] No. 40.

Deloitte, 2022. Digitizing Monitoring, Testing, and Operating Your Controls Environment. *Deloitte Development LLC*. [Presentation].

Deumes, R. and Knechel, W.R., 2008. Economic incentives for voluntary reporting on internal risk management and control systems. *Auditing: A Journal of Practice & Theory*, 27(1), pp.35–66.

Eisenhardt, K.M., 1989. Building theories from case study research. Academy of Management Review, 14(4), pp.532–550.

Eisenhardt, K.M. and Graebner, M.E., 2007. Theory building from cases: Opportunities and challenges. Academy of Management Journal, 50(1), pp.25–32.

Eisenhardt, K.M., 1989. Agency Theory: An Assessment and Review. *Academy of Management Review*, 14(1), pp.57-74.

Economic Commission for Latin America and the Caribbean (ECLAC), 2024. *A digital path for sustainable development in Latin America and the Caribbean (LC/CMSI.8/3)*. United Nations.

Fontana, A. and Frey, J.H., 2005. The interview: From neutral stance to political involvement. In: N.K. Denzin and Y.S. Lincoln, eds. The Sage Handbook of Qualitative Research. 3rd ed. Thousand Oaks: Sage Publications, pp.695–727.

Fama, E.F., 1980. Agency Problems and the Theory of the Firm. *Journal of Political Economy*, 88(2), pp.288-307.

Fama, E.F. and Jensen, M.C., 1983a. Agency Problems and Residual Claims. Journal of Law and Economics, 26(2), pp.327–349.

Fama, E.F. and Jensen, M.C., 1983b**.** *Separation of Ownership and Control*. *Journal of Law and Economics*, 26(2), pp.301–325.

Jensen, M.C. and Meckling, W.H., 1976. Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *Journal of Financial Economics*, 3(4), pp.305-360.

Gill, P., Stewart, K., Treasure, E. and Chadwick, B., 2008. Methods of data collection in qualitative research: interviews and focus groups. British Dental Journal, 204(6), pp.291–295.

Hao, S., 2025. Research on the path to improve internal control quality of enterprises under digital transformation. *Information Daily*, 24 March. (In Chinese)

Jensen, M.C. and Meckling, W.H., 1976. Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. Journal of Financial Economics, 3(4), pp.305-360.

Kan, D.; Lyu, L.; Huang, W.; Yao, W. Digital Economy and the Upgrading of the Global Value Chain of China's Service Industry. J. Theor. Appl. Electron. Commer. Res. 2022, 17, 1279–1296.

Kallio, H., Pietilä, A.M., Johnson, M. and Kangasniemi, M., 2016. Systematic methodological review: Developing a framework for a qualitative semi‐structured interview guide. Journal of Advanced Nursing, 72(12), pp.2954–2965.

Kvale, S. and Brinkmann, S. (2009) InterViews: Learning the craft of qualitative research interviewing. 2nd ed. Thousand Oaks, CA: Sage.

Li, C., 2022. Research on the optimization path of internal control in banks under digital transformation. China Finance, (15), pp.85–87. (In Chinese)

Li, L.X., 2025. Establishing a Digitally-Based Internal Control System in Enterprises. *China Certified Public Accountant*, (9), pp.120-124. (In Chinese)

Lincoln, Y.S. and Guba, E.G., 1985. Naturalistic Inquiry. Beverly Hills: Sage Publications.

Lv, Z.J. and An, X.B., 2025. Optimization Path of Internal Control Management in State-Owned Enterprises under Digital Transformation. *China Township Enterprise Accounting*, (9), pp.89-94. (In Chinese)

McLeod, S. (2024) The Interview Method in Psychology. Simply Psychology,pp72.

National Development and Reform Commission (NDRC), 2021. The 14th Five-Year Plan for the Development of the Digital Economy. [online] Beijing: NDRC. (In Chinese)

OECD, 2020. Digital Transformation in the Age of COVID-19: Building Resilience and Bridging Divides. [online] Paris: OECD Publishing.

Ouyang, L., 2025. The Impact of Internal Control on the Operating Performance of Manufacturing Enterprises: The Moderating Effect of Digital Transformation. *Friends of Accounting*, (10), pp.105-110. (In Chinese)

Ogundimu, O., 2025. Artificial Intelligence in Financial and Operational Risk Management: A Critical Analysis. *Cognizance Journal of Multidisciplinary Studies*, 5(3), pp.484–506.

Oluwagbemi, O., Abah, J. and Achimugu, P., 2011. The impact of information technology in Nigeria's banking industry. *Journal of Computer Science and Engineering*, 7(2), pp.63–67.

People's Bank of China (PBoC), 2020. Fintech Development Plan (2019–2021). [online] Beijing: The People's Bank of China. (In Chinese)

Patton, M.Q., 1999. Enhancing the quality and credibility of qualitative analysis. Health Services Research, 34(5 Pt 2), pp.1189–1208.

Protiviti Inc., 2013. *The updated COSO internal control framework: Frequently asked questions*.

Qin, Z., 2024. Does the digital transformation of an organization improve the quality of internal controls? *Transactions on Economics, Business and Management Research*, 7, pp.n/a.

Shaban, O.S. and Omoush, A., 2025. AI-Driven Financial Transparency and Corporate Governance: Enhancing Accounting Practices with Evidence from Jordan. *Sustainability*, 17(9), 3818.

Shenton, A.K., 2004. Strategies for ensuring trustworthiness in qualitative research projects. Education for Information, 22(2), pp.63–75

Shleifer, A. and Vishny, R.W., 1997. A Survey of Corporate Governance. *The Journal of Finance*, 52(2), pp.737-783.

Saunders, M., Lewis, P. and Thornhill, A., 2019. Research Methods for Business Students. 8th ed. Harlow: Pearson Education.

Schein, E.H., 1983. *The role of the founder in the creation of organizational culture*. Working Paper 1407-83. Sloan School of Management, Massachusetts Institute of Technology.

Tucker, A.L., Nembhard, I.M. and Edmondson, A.C. (2008) 'Implementing new practices: An empirical study of organizational learning in hospital intensive care units', Management Science, 53(6), pp. 894–907.

Tan, C., 2025. Trends and Construction Approaches of Enterprise Internal Control in the Era of Intelligent Digitalization. *China Internal Audit*, (4), pp.56-61. (In Chinese)

Wang, C., Wang, D., Deng, X. and Wang, S., 2023. Research on the impact of enterprise digital transformation on internal control. *Sustainability*, 15(10), p.8392.

Xiong, J. and Guo, Y., 2024. Research on the impact of enterprise digital transformation on enterprise performance: Based on financing constraint perspective. *Finance*, 14(4), pp.1258–1273. (In Chinese) Available at: [https://pdf.hanspub.org/fin2024144_51141060.pdf]. Accessed, [2025-04-22]

Xia, Z. and Zhang, Y., 2023. Enterprise digital transformation and internal control effectiveness: Based on the perspective of managerial characteristics. *Journal of Hubei University of Economics*, 21(5), pp.55–67. (In Chinese)

Yin, R.K., 2014. Case Study Research: Design and Methods. 5th ed. Thousand Oaks: Sage Publications.

Zhu, Y. and Jin, S. (2023) 'COVID-19, digital transformation of banks, and operational capabilities of commercial banks', Sustainability, 15(11), p. 8783.

Zou, Y., 2025. Reconstruction of Enterprise Internal Control System under the Background of Digital Transformation. *China Agricultural Accounting*, (May, second half), pp.81-86. (In Chinese)

Zhang, B. (2022). The dual effects of digital leadership on employee innovation performance. Master's thesis, Southwestern University of Finance and Economics.

Zhou, X.Y. and Xu, Z.D., 2023. The Impact of Traceability Practices and Dynamic Capabilities on Innovation Performance: Evidence from Chinese Manufacturing Enterprises. *Science and Technology Progress and Policy*, 40(9), pp.65–73. (In Chinese)

Appendix

Appendix A: Interview Communication Methods, Timeline, and Respondent Information（First time）

To ensure transparency in the data collection process and enhance the reliability of this study, the following table summarizes key details from the initial interviews, including the communication methods, timeframe, language used, and the respondents' organizational roles:

Respondent ID	Position	Interview Period	Communication Method	Language Used
Respondent A	Senior Management	April 30, 2024 – May 3, 2024	WeChat and phone (text & voice)	Mandarin
Respondent B	Head of Customer Service	May 1, 2024 – May 5, 2024	WeChat and phone (text & voice)	Cantonese
Respondent C	Head of Risk Management	May 1, 2024 – May 5, 2024	WeChat and phone (text & voice)	Cantonese

Note: All interviews were conducted remotely through non-face-to-face communication. Due to privacy and ethical considerations, no recordings were made. Detailed notes were taken by the research team during each session. These notes were later sent to the respective respondents for verification and confirmation. All interview content was used in this study with the informed consent of the participants.

Appendix B:

Dear leader, hello! I am currently writing a paper on "The impact of digital transformation on corporate internal control", and I have selected China Construction Bank as a research case.

This questionnaire mainly focuses on the actual changes in the internal control system under the background of digital transformation. The design refers to the COSO framework. The questions are concise and do not involve any sensitive business information. It is only used for academic research.

Your valuable answers will provide important support for my research. Thank you very much for your participation.

1. In the process of banks promoting digitalization, how does the management guide employees to adapt to this change? Are there any new systems or cultural constructions?

2. What do you think are the main new risks faced by banks in digital transformation? For example, in terms of data security, customer privacy, etc.?

3. How does your bank discover and respond to these digital-related risks in advance? Will some technological means be used to help?

4. After digitalization, have traditional operations such as approval and authorization become more efficient or more automatic? If possible, can you give an example?

5. Under the new system, how to ensure that the operation process is both efficient and secure? For example, how to control permissions?

6. Does the bank now have a unified digital platform to help different departments communicate and share information better?

7. How does management usually quickly grasp important information in internal control or business operations?

8. Does digitalization make banks more timely or smarter in problem discovery and internal inspections?

9. For example, will departments such as audit and risk control use some system tools to monitor risks in real time?

10. What do you think is the biggest help of digital transformation to bank internal control? Do you think there is still room for improvement?

Appendix C:

Sample questions

Research topic: The impact of digital transformation on corporate internal control

Interview date: May 6, 2025

Q1. In the process of digital transformation, do you think CCB has always emphasized integrity and professional ethics?

• [Prompt] For example: Have you received relevant ethics training? Did the management mention compliance and responsibility?

_____

Q2. Do you feel that the company structure or division of responsibilities has changed after the digital transformation? What impact does it have on your position?

_____

Q3. "Have you known or participated in the preparatory activities before the launch of new technologies? Have these preparations helped you?"

• [Prompt] For example: Before a new system (such as smart approval, online operation platform) was launched, did you receive training or guidance manuals?

Q4. In digital transformation, do you know what mechanisms the company has to prevent potential operational errors or misconduct? ”

_____

Q5. After the digital tools were launched, were there any new processes or control measures in your work? Are these changes clear and easy to understand?

• [Hint] For example, automatic approval system, new clock-in rules or data entry methods.

Q6. Do you think the technical system (such as mobile banking backend, process platform) has appropriate permissions and control mechanisms?

List of Figures and Tables

Participant ID	Interview Date	Interview Mode	Department	Role/Position	Duration
Participant A	4 May 2025	Video Call	Senior Management	Strategic/Executive Role	30 minutes
Participant B	6 May 2025	Video Call	Customer Service	Department Head	30 minutes
Participant C	6 May 2025	Video Call	Risk Management	Department Head	30 minutes

(Table2.1) Summary of interviews with participants A-C

Respondent	Times of interviews	Interview date	Interview duration	Communication	Data format
D	2 times	First time: May 6 , 2025 Second time: May 13 , 2025	First time: 3 hours, second time: 15 minutes	First time: WeChat voice + text Second time: WeChat call	Notes and Memoirs
E	2 times	First time: May 6 , 2025 Second time: May 13, 2025	First time: 1 hours, second time: 1 hours 15 minutes	First time: WeChat voice + text Second time: WeChat voice + text	Notes and Memoirs

Respondent	Times of interviews	Interview date	Interview duration	Communication	Data format
F	2 times	First time: May 6 , 2025 Second time: May 14 , 2025	First time: 3 hours 35 minutes second time: 4 hours	First time: WeChat voice + text Second time: WeChat voice + text	Notes and Memoirs
G	2 times	First time: May 7 , 2025 Second time: May 14 , 2025	First time: 5 hours 20 minutes second time: 30 minutes	First time: WeChat voice + text Second time: WeChat call	Notes and Memoirs
H	2 times	First time: May 7 , 2025 Second time: May 14 , 2025	First time: 3 hours second time: 6hours	First time: WeChat voice + text Second time: WeChat voice+text	Notes and Memoirs

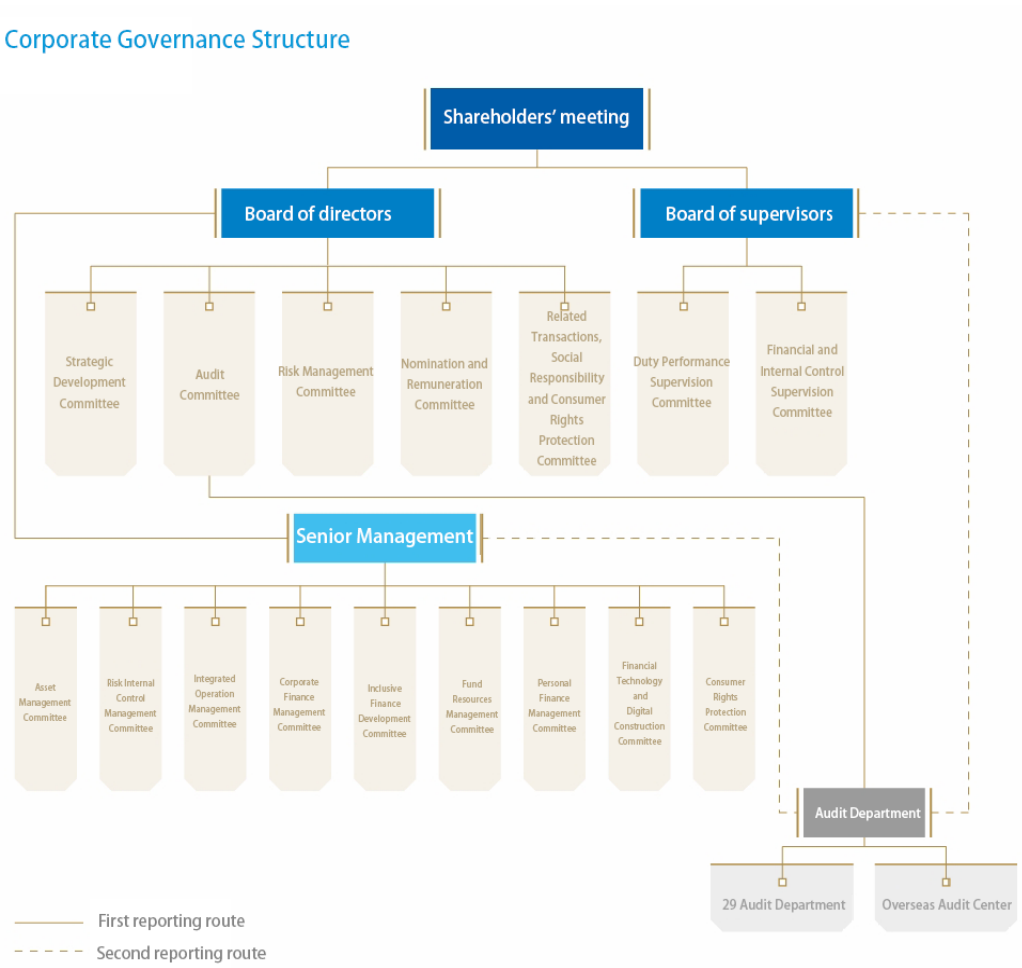
(Table 2.2 Informal Interview Schedule)

Theme	Core purpose	Sample question (open-ended)
1. Digital Tool Experience (Control	Understand the actual application effects and adaptability of digital tools	What is the digital tool you use most frequently in your daily work? How did it change your

Environment)	by grassroots employees	original workflow?
2.Process Changes and Compliance Perception (Risk Assessment)	Explore whether digitalization has simplified internal control processes or brought about new compliance challenges	After some of the work that relied on manual review in the past was replaced by the system, do you think it is more reliable or more error-prone?
3. Cross-departmental collaboration (Information and Communication	Identify the problems of interdepartmental collaboration in digital transformation	When collaborating with other departments (such as the technology department), do conflicts arise due to system incompatibility or data silos?
4. Skills Training (Control activities)	Understand whether the digital capabilities of grassroots employees match the demands of transformation	Is the digital training provided by the bank sufficient? Which skill do you most wish to enhance?
5. Moral Hazard and Compliance (Monitoring)	Understand the short-term and fraudulent behaviors caused by digital transformation and automated assessment	Do you think there are any unreasonable aspects in digital assessment? Has the bank put forward new requirements for your professional ethics and compliance after the digital transformation?

(Table2.3 The topic of the first informal interview)

(Figure 5.1)Display of some CCB honors



(Figure 5.2)CCB organizational chart

AI Contribution Statement

This article uses ChatGpt and DeepSeek tools to search for references and provide writing suggestions. All texts or suggestions generated by AI tools are reviewed by team members to ensure academic rigor and originality.