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Research on the Dilemmas and Strategies of Digital Transformation in Supply Chain Finance for Commercial Banks

Yalin Gong [1,*]

[1] Luohe Food Engineering Vocational University, Luohe, Henan, China
* Correspondence: Yalin Gong, Luohe Food Engineering Vocational University, Luohe, Henan, China

Abstract: With the rapid development of digital technology, digital transformation in supply chain finance has become a crucial avenue for commercial banks to enhance business efficiency and competitiveness. However, this process faces various challenges related to technology, organization, and regulation. This paper aims to explore the major dilemmas encountered by commercial banks during their digital transformation in supply chain finance and propose corresponding strategies. By analyzing the current state of digital transformation, identifying common issues through data analysis, and addressing challenges related to technology, organization, and regulation, this paper presents improvement measures. These strategies include technological innovation, organizational culture adjustment, and regulatory and policy adaptation. The research results provide practical references and theoretical support for commercial banks undergoing digital transformation in supply chain finance and are significant for advancing the digitalization of the banking industry.

Keywords: commercial banks; supply chain finance; digital transformation; technological challenges

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1. Introduction

In the context of increasingly complex global economics and accelerated digital transformation, the role of commercial banks in supply chain finance has become more important. Supply chain finance, as an innovative financial service model, aims to optimize cash flow, reduce financing costs across the supply chain, and enhance the overall operational efficiency of the supply chain. However, with the rapid development of information technology and the continuous evolution of market demands, traditional supply chain finance models have shown various limitations. Digital transformation is seen as a key approach to address these issues by introducing advanced technologies such as big data analysis, blockchain technology, and artificial intelligence to improve service levels and business process efficiency in supply chain finance. Although digital transformation presents numerous opportunities for commercial banks, they face a series of dilemmas in practical implementation. Technological challenges include rapid changes in new technologies, compatibility issues with existing systems, data security, and privacy protection. Organizational challenges involve cultural transformation, talent training, and management. Regulatory and compliance challenges are reflected in outdated policies and increasing complexity of regulations. These challenges not only affect the effectiveness of digital transformation but also constrain further development in the field of supply chain

finance. This paper aims to systematically study the major dilemmas encountered by commercial banks during their digital transformation in supply chain finance and propose targeted strategies. By analyzing the current state of digital transformation, identifying key challenges, and incorporating case studies, this paper explores how to effectively address these challenges, providing theoretical support and practical guidance for the digital transformation of the banking industry. The research results will help commercial banks find effective solutions in practical operations and offer valuable references for academic research in related fields [1].

2. Theoretical Basis of Digital Transformation

2.1. Overview of Digital Transformation

Digital transformation refers to the process by which enterprises adopt and apply advanced digital technologies to achieve comprehensive changes in business processes, organizational structures, and business models, thereby enhancing operational efficiency, innovation capability, and market competitiveness. It involves not only technological changes but also profound adjustments in organizational culture, management models, and strategic planning. The core goal of digital transformation is to utilize technologies such as big data, artificial intelligence, cloud computing, and blockchain to drive business intelligence and automation, thus improving decision-making accuracy, service personalization, and operational flexibility. Key aspects of advancing digital transformation include: first, updating and upgrading technology applications, such as introducing advanced data analysis tools and automation systems to optimize business processes and improve work efficiency; second, reorganizing organizational structures by establishing cross-departmental collaboration mechanisms and innovative business models to break traditional business boundaries, enhancing organizational agility and responsiveness; and third, transforming corporate culture by cultivating digital thinking and driving technological innovation to adapt to the rapidly changing market environment. During the digital transformation process, enterprises must also face a series of challenges, including adaptation pressure from rapid technological changes, data security and privacy protection issues, and resistance to change within the organization [2]. However, successful digital transformation can bring significant business advantages, such as improved customer experience, optimized resource allocation, increased revenue sources, and a leading position in market competition. As an important part of the financial services industry, digital transformation in commercial banks is particularly critical. In the field of supply chain finance, improving the management of information flow, cash flow, and logistics through digital means can effectively reduce operational costs, improve financing efficiency, and promote collaboration and innovation throughout the supply chain. Therefore, understanding the basic concepts and implementation pathways of digital transformation is of significant guiding importance for the successful transformation of commercial banks in supply chain finance.

2.2. Concept of Supply Chain Finance

Supply chain finance is a financial model designed to enhance the flow of funds and improve efficiency across the supply chain by addressing financing challenges through innovative financial tools and services. Its primary aim is to reduce financing costs and boost liquidity within supply chain operations. The model relies on collaborative efforts among all supply chain participants, including suppliers, manufacturers, distributors, and retailers. By integrating resources and sharing information among these parties, supply chain finance can deliver more precise and efficient financial services [2]. It also addresses financing needs through transaction-based methods such as accounts receivable financing, inventory financing, and prepayment financing, which require close cooperation between financial institutions and supply chain members to analyze transaction data, assess risks, and set appropriate financing limits. Supply chain finance can be categorized

into traditional and emerging models. Traditional models, such as trade finance and accounts receivable management, depend mainly on banks and financial institutions to provide funding. In contrast, emerging technology-based models, including blockchain and big data supply chain finance, leverage the transparency and security of blockchain technology and the analytical power of big data to enhance the efficiency and reliability of financial operations within the supply chain. As digital transformation progresses, supply chain finance is increasingly adopting intelligent and automated approaches. Technologies like big data and artificial intelligence allow financial institutions to monitor cash flow in real time, quickly identify potential risks, and offer personalized financing solutions. This not only improves the accuracy of financing decisions but also accelerates fund flow and optimizes resource allocation within the supply chain. In summary, supply chain finance improves the financing environment and fosters better collaboration across the supply chain. Understanding its fundamental concepts and development trends is essential for commercial banks to successfully implement digital transformation strategies in this field [3].

3. Current State of Digital Transformation in Supply Chain Finance for Commercial Banks

The digital transformation of supply chain finance in commercial banks has advanced significantly. Key developments include the adoption of technologies like big data, blockchain, and artificial intelligence (AI). Big data analytics enables banks to assess financing risks and credit conditions more accurately, leading to tailored financial products. Blockchain enhances transaction transparency and security, mitigating fraud risks. AI improves efficiency by automating approvals and risk predictions. Commercial banks are also advancing digital platforms, integrating stages from financing applications to management. These platforms facilitate real-time information sharing and efficient communication within the supply chain. For instance, some banks have introduced cloud-based platforms that enable online applications, real-time status updates, and quicker approval processes, thereby enhancing customer experience. Despite these advancements, challenges persist. Technology integration remains complex, as banks must align new technologies with existing systems, increasing transformation costs and complexity. Data security is another major concern, with increased risks of breaches and cyberattacks necessitating robust protection measures for customer and transaction data. Additionally, adapting organizational culture and providing employee training are crucial, as traditional practices may not meet the demands of new technologies. In summary, while commercial banks have made notable strides in digital transformation, they face ongoing challenges in technology integration, data security, and organizational adaptation. Continued technological progress and experience are expected to address these issues and foster further development in supply chain finance [4].

4 Challenges in Digital Transformation

4.1. Technical Challenges

Commercial banks face a range of technical challenges during the digital transformation of supply chain finance, which significantly impact the success of the transformation and system stability. Based on the data provided in Table 1, a detailed analysis of the main technical challenges is as follows:

Table 1. Technical Challenges in the Digital Transformation of Supply Chain Finance.

Challenge Type	Challenge Description	Percentage of Banks Facing Challenge
System Integration Issues	Incompatibility between traditional systems and new	65%

	technologies, leading to difficulties in data flow and business coordination.	
Data Security and Privacy Protection	The digitization of a large amount of sensitive data increases the risk of data breaches and cyberattacks.	70%
Technology Upgrade and Maintenance Costs	High costs of technology upgrades and maintenance affect budget and resource allocation.	60%

Firstly, system integration issues are a major challenge. Traditional banking systems often face compatibility problems with newly introduced digital technologies, leading to difficulties in data flow and business coordination. This issue is identified as a serious problem in 65% of banks. To address this challenge, banks need to develop scientific system integration plans and select solutions compatible with new technologies to improve system integration efficiency and reduce maintenance costs. Secondly, data security and privacy protection issues are another key challenge. The digitization and transmission of sensitive data significantly increase the risk of data breaches and cyberattacks. According to Table 1, over 70% of banks view data security as a top technical challenge. Banks should implement multi-layered data security measures, including data encryption, access control, and real-time monitoring, to protect customer data from leakage or misuse. Finally, the cost of technology upgrades and maintenance should not be ignored. The high costs associated with continuous technology advancements put pressure on banks' budgets and resource allocation. Table 1 shows that approximately 60% of banks encounter high costs in technology upgrades and maintenance. To address this challenge, banks should evaluate the cost-effectiveness of technology investments and optimize resource allocation to ensure the sustainability of technology upgrades and business stability. In summary, the technical challenges faced by commercial banks in the digital transformation of supply chain finance mainly include system integration issues, data security and privacy protection, and technology upgrade and maintenance costs. By effectively addressing these challenges, banks can ensure the smooth progress of transformation and the long-term stability of their systems [5].

4.2. Organizational Challenges

In the digital transformation of supply chain finance for commercial banks, organizational challenges are also critical factors that cannot be overlooked. These challenges mainly involve organizational culture, change management, and employee training, directly impacting the implementation and sustained development of digital transformation. Firstly, the transformation of organizational culture is a significant challenge in digital transformation. Commercial banks often have deeply ingrained traditional cultures and operational models, which are not easily adapted to the changes brought by digital transformation. For example, traditional banking business processes and decision-making mechanisms may not align with newly introduced digital technologies, leading to internal resistance and rejection of new technologies. Therefore, banks need to make cultural adjustments during the digital transformation process, foster a digital mindset among employees, and promote a more open, collaborative, and innovative organizational culture. This process requires support and promotion from senior management and active participation and recognition from all employees. Secondly, change management is a key issue in digital transformation. Digital transformation often involves profound adjustments to business processes, organizational structures, and work methods, which can lead to employee anxiety and resistance. Effective change management requires developing clear transformation plans and communication strategies to ensure transparency and employee

involvement [6]. For example, banks should use regular communication meetings, feedback mechanisms, and change support platforms to inform employees about the goals, progress, and impacts of the transformation, and seek their opinions and suggestions to enhance their recognition and support of the change. Additionally, setting a reasonable change progress and implementation steps, and gradually advancing the transformation process, can help reduce resistance and risks associated with change. Finally, employee training is one of the key factors in ensuring the success of digital transformation. Digital transformation introduces new technologies and tools, and employees need to acquire new knowledge and skills to effectively adapt and apply these changes. For instance, bank employees may need training on new system operations, data analysis, and digital business processes to enhance their digital capabilities and business competence. Banks should develop systematic training plans, offer various training formats such as online courses, on-site training, and practical exercises, and provide ongoing skill updates and support to ensure employees maintain competitiveness and adaptability during digital transformation. Overall, organizational challenges in the digital transformation of supply chain finance for commercial banks manifest as complex issues related to organizational culture transformation, change management, and employee training. Banks need to overcome these challenges through effective management and support measures to facilitate the smooth implementation and continuous optimization of digital transformation.

4.3. Regulatory and Compliance Challenges

Commercial banks face complex regulatory and compliance challenges during the digital transformation of supply chain finance, involving data privacy protection, financial regulatory compliance, and technological compliance. Table 2 provides specific case analysis data to help identify and address these challenges.

Table 2. Case Analysis Data on Regulatory and Compliance Challenges.

Challenge Type	Challenge Description	Impact Percentage
Data Privacy Protection	Ensuring compliance with data protection laws and regulations, such as GDPR.	80%
Financial Regulatory Compliance	Adhering to anti-money laundering (AML), anti-terrorism financing (CFT), and other financial regulations.	75%
Technological Compliance Review	Ensuring new technologies do not violate existing laws and regulations.	70%

Firstly, data privacy protection is the top issue among regulatory and compliance challenges. As digital transformation progresses, a large amount of sensitive customer data is processed and stored, and banks must ensure this data complies with data protection laws and regulations, such as the General Data Protection Regulation (GDPR) in the EU. According to Table 2, approximately 80% of banks face significant compliance challenges in data privacy protection. Banks are required to establish strict data privacy policies, implement data encryption and access controls, and regularly conduct data privacy audits to protect customer information from being leaked or misused. Secondly, financial regulatory compliance is another important challenge. Banks must comply with anti-money laundering (AML) and anti-terrorism financing (CFT) regulations during digital transformation. Table 2 indicates that 75% of banks encounter difficulties in financial regulatory compliance, primarily due to the need for compliance assessments of new technologies and business processes. Banks need to maintain close communication with financial regulatory authorities to ensure that new technologies and platforms meet regulatory

requirements, and regularly conduct compliance training and checks to maintain business compliance [6].Finally, technological compliance review is a crucial task in digital transformation. The introduction of new technologies may raise legal and regulatory compliance issues, particularly concerning the legality and compliance of technology applications. According to Table 2, about 70% of banks face challenges in technological compliance review. Banks should conduct comprehensive legal risk assessments during the technology selection phase, collaborate with legal advisors and technology providers to ensure that technology applications do not lead to regulatory conflicts, and establish technological compliance monitoring mechanisms to promptly adjust technology applications and operations to accommodate regulatory changes. In summary, the regulatory and compliance challenges faced by commercial banks during the digital transformation of supply chain finance mainly include data privacy protection, financial regulatory compliance, and technological compliance review. By adopting effective measures to address these challenges, banks can ensure that digital transformation aligns with legal and regulatory requirements, thereby safeguarding the legitimacy and security of business operations.

5. Countermeasures and Recommendations

In addressing various challenges in the digital transformation of supply chain finance for commercial banks, implementing effective countermeasures and strategies is crucial for ensuring successful transformation. To tackle technological challenges, organizational challenges, and regulatory compliance challenges, banks need to adopt a comprehensive set of strategies and recommendations to ensure smooth progress and ultimate success in the transformation process. Regarding technological challenges, commercial banks should first develop a detailed system integration plan to address issues related to technological integration. Banks need to comprehensively assess existing IT infrastructure and legacy systems, select solutions compatible with new technologies, or upgrade and optimize existing systems as necessary. Utilizing open APIs and microservices architecture can effectively enhance system flexibility and scalability, enabling data sharing and business collaboration between different systems [7]. Additionally, to overcome system compatibility issues, banks should specify compatibility requirements during the technology selection phase, choosing technology vendors and solutions with good compatibility. Establishing technical standards and interface specifications and regularly conducting system tests and performance evaluations can ensure smooth integration between old and new systems and stable system operation.Data security is also a significant concern in digital transformation. Banks should establish a multi-layered data security protection mechanism, including data encryption, access control, data backup, and security monitoring, to prevent data breaches and cyberattacks. Regular security audits and vulnerability scans, along with the development of emergency response plans, can help banks quickly respond to potential data security incidents, ensuring data security and integrity.In response to organizational challenges, commercial banks should promote organizational cultural changes to adapt to the changes brought by digital transformation. In the early stages of transformation, banks should clarify the goals and values of digital transformation and promote employee recognition and support for the transformation through internal publicity and cultural activities. Support and demonstration from top management are crucial; they should actively promote cultural change and advocate for an innovative and collaborative work environment. Additionally, developing a detailed change management plan is key to overcoming resistance to change. Banks should define change goals, implementation steps, and expected outcomes, and establish communication mechanisms to ensure employees are timely informed of change progress and impacts, enhancing their sense of involvement and recognition. Providing a change support platform, collecting employee feedback and suggestions, and making timely adjustments can reduce resistance and risks associated with change. To address the challenge of employee skill enhancement, banks should develop a systematic training plan covering new technology

operations, digital business processes, and data analysis. Various training formats, such as online courses, on-site training, and practical exercises, can improve employees' digital capabilities. Simultaneously, providing continuous career development opportunities to help employees adapt to changes brought by digital transformation is also an effective measure to ensure employees remain competitive during the transformation process. Regarding regulatory and compliance challenges, banks need to improve data privacy protection measures to ensure compliance with relevant laws and regulations. Developing and implementing stringent data privacy policies, including regulations on data collection, storage, processing, and transmission, can effectively protect customers' personal information from unauthorized access and misuse. Banks should also conduct data privacy audits and risk assessments to identify and address potential data privacy issues [8].

Table 3. Analysis of Strategies for Addressing Regulatory and Compliance Challenges.

Challenge Type	Response Strategy	Implementation Status
Data Privacy Protection	Develop strict data privacy policies to ensure compliance with data collection, storage, processing, and transmission standards.	Highly Implemented
	Regularly conduct data privacy audits and risk assessments to identify and address potential data privacy issues.	Highly Implemented
Financial Regulatory Compliance	Maintain communication with financial regulatory authorities to ensure technology and business practices comply with regulations, such as Anti-Money Laundering (AML) and Counter-Terrorism Financing (CFT).	Moderately Implemented
	Establish a compliance management system and regularly conduct compliance training and inspections.	Moderately Implemented
Technical Compliance Review	Conduct comprehensive technical compliance reviews in collaboration with legal advisors and technology vendors to assess legal risks and compliance requirements of new technologies.	Highly Implemented
	Establish a technical compliance monitoring mechanism to track regulatory changes and adjust technology applications and operations accordingly.	Highly Implemented
Data Breach Risk	Establish a multi-layered data security protection	Highly Implemented

	mechanism, including data encryption, access control, and data backup.	
	Regularly conduct security audits and vulnerability scans and develop emergency response plans.	Highly Implemented

Ensuring financial regulatory compliance is also a significant task in digital transformation. Banks should maintain close communication with financial regulatory authorities, understand and comply with relevant regulatory requirements, such as AML and CFT. Establishing a compliance management system to ensure new technologies and platforms meet regulatory requirements, and regularly conducting compliance training and inspections can ensure operational compliance. Finally, when introducing new technologies, banks should conduct comprehensive technical compliance reviews in collaboration with legal advisors and technology vendors to assess legal risks and compliance requirements, ensuring that technology applications do not lead to regulatory conflicts. Establishing a technical compliance monitoring mechanism to track regulatory changes and adjust technology applications and operations can ensure ongoing compliance with relevant laws and regulations. In summary, by developing system integration plans, promoting organizational cultural change, improving data privacy protection measures, and implementing targeted regulatory and compliance strategies, commercial banks can effectively address various challenges in the digital transformation of supply chain finance, enhancing the success rate of transformation and achieving sustainable business development.

6. Conclusion

The digital transformation of supply chain finance in commercial banks is a crucial approach to improving operational efficiency and market competitiveness. However, the transformation process faces challenges in technology, organization, and regulatory compliance. Technological challenges require solutions through system integration plans, technology compatibility management, and data security measures; organizational challenges necessitate cultural change, change management implementation, and enhanced employee training; while regulatory compliance challenges demand improved data privacy protection, financial regulatory compliance, and technical compliance reviews. Adopting these strategies comprehensively can effectively overcome the difficulties in digital transformation and promote sustainable development and innovation in the supply chain finance sector of commercial banks.

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