Research on Digital Technology Empowering Green Finance: Evidence from Financial Enterprises

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Abstract. Carbon neutrality has become a global consensus, and digital technology can play an important role in achieving carbon neutrality. The paper focuses on empowering financial institutions with digital technology to achieve green and low-carbon transformation. It is believed that empowering financial institutions with digital technology can help reduce their own energy consumption, expand the supply of green financial products, and improve the efficiency of green financial services. The paper takes BNP Paribas, Mitsubishi UFJ Group, HSBC Group, Industrial and Commercial Bank of China, China Construction Bank, Ping An Group and other enterprises as examples.

Keywords: digital technology, green finance, blockchain, PUE

1 Introduction

Chinese government has proposed to actively and steadily promote carbon peaking and carbon neutrality, and accelerate the construction of a digital China. To achieve the requirements of the 20th National Congress of the Communist Party of China on "improving the carbon emission statistical accounting system", "precision" is the basic support and digital technology is needed as the starting point. The Financial Technology Development Plan (2022-2025) issued by the People's Bank of China points out that, "In the field of green finance, digital technology is used to carry out green quantitative and qualitative analysis, strengthen the intelligent identification ability of green enterprises and green projects, improve the measurement, accounting and disclosure level of Carbon footprint, provide enterprises with diversified financial products and services such as green credit, Green bond, green insurance, carbon finance, etc. under the premise of legal compliance and controllable risks; use Big data, artificial intelligence and other technologies to establish green information monitoring and analysis model To build a risk Knowledge graph to achieve risk monitoring of enterprises, quantify environmental benefits and transformation risks, and improve green financial risk management capabilities.

Digitalization and greening have become two important directions for economic recovery after the epidemic. Digital technology plays an important role in the fields of

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green enterprise identification, information disclosure, risk control, and research and development of green financial products, providing strong support for the construction of green financial systems and promoting sustainable development of green finance.

(1) Empowering digital technology is beneficial for reducing the energy consumption of financial institutions themselves. Digital technology itself has green attributes, with the "green" characteristics of reducing energy consumption and improving efficiency. At present, digital technology has penetrated all industries and covered all kinds of scenarios of life. The use of AI, Big data, blockchain and other digital technologies can enable green and low-carbon transformation of all industries and systematically improve the efficiency of energy and resource utilization. For financial institutions, the use of digital technology can achieve monitoring, accounting, and management of their own carbon emissions data, which helps to further deepen energy conservation and emission reduction, improve efficiency, and achieve green and low-carbon operation goals.

(2) Empowering digital technology is beneficial for expanding the supply of green financial products. Empowering digital technology helps to expand the spectrum of green financial products and meet the multi-level, diversified, and multi scenario financing needs of enterprises and customers. First, Big data, cloud computing and other technologies can collect and process massive information, more accurately discover customers' green financial needs in different scenarios and different life cycle stages, and provide data support for the innovation and supply of green financial products [1]. Secondly, digital technology can improve the efficiency of information collection and transmission, improve computing speed, and provide computational power and efficiency support for the development of financial products. Thirdly, research and development based on blockchain and other technologies have transparent, traceable, and tamper resistant characteristics, which is conducive to promoting property protection and healthy development of green financial product innovation [2].

(3) Empowering digital technology can help improve the efficiency of green financial services. Firstly, the empowerment of digital technology helps to achieve quantifiable and verifiable green finance activities, making green finance more precise, resource allocation more efficient, and improving the efficiency of traditional green finance business services [3]. Second, digital empowerment can broaden the scene and channels of green financial services, reduce transaction costs, expand service coverage, and improve the scale effect. Relying on massive customer resources and advanced digital technology, Network effect form, making the Marginal cost of the platform serving a single new customer drop continuously [4]. Thirdly, the empowerment of digital technology helps to improve the level of risk management. By improving the intelligent risk control system, it provides systematic support for the full process management of various risks, including climate risk.

2 Foreign Experience in Empowering Green Finance with Digital Technology

Financial institutions in developed countries attach strategic importance to green finance and digitization, and strengthen the comprehensive application of digital technology in the field of green finance, such as empowering green financial products and services, and improving carbon management efficiency.

(1) Strategically attach importance to green finance and digitization. Financial institutions in developed countries actively carry out forward-looking strategic layout, and prioritize green development and digitization as key strategic directions for enterprises. Taking Table 1 as an example, BNP Paribas has made green and low-carbon transformation the core of its development strategy for 2022-2025, and has identified the theme of its development strategy as "growth, technology, and sustainability (mainly focusing on carbon neutral transformation)"; Mitsubishi UFJ Group regards "sustainable operation (ESG), digitalization, growth and new challenges" as the three major development themes in 2022-2025; In order to achieve the strategic goal of becoming the preferred international financial partner for customers, HSBC Group has proposed four development themes: "focusing on strengths, large-scale digitization, empowering growth, and transitioning to carbon neutrality".

Table 1. Strategic Direction of Typical International Large Financial Institutions

Corporate	Long Term Vision	2022-2025 Strategic Direction
BNP Paribas	Always puts customers first and is committed to becoming a trustworthy partner for customers	Growth, technology, and sustainability
Mitsubishi UFJ Group	Becoming the World's Most Trusted Financial Group	Sustainable operation, digitalization, growth and new challenges
HSBC Group	Becoming the preferred international financial partner for customers	Focusing on strengths, large-scale digitization, empowering growth, and transitioning towards net zero emissions

Organize according to the ESG and TCFD reports of each enterprise.

(2) Empowering green financial products and services through digital technology. With the increasing scale and complexity of global financial market transactions, the role of digital technology in various financial services is becoming increasingly prominent. The first is to use digital technology to enable green credit, Green bond, green funds, green insurance, carbon financial products, etc [5]. For example, BNP Paribas cooperated with State Power Corporation of China to issue Green bond using blockchain technology to improve the transparency and traceability of bond information. The second is to use digital technology to improve the quality and efficiency of carbon finance market services. For example, nine financial institutions,

including UBS, Standard Chartered Bank and Sumitomo Mitsui Banking Corporation, have built a blockchain based Carbon credit trading network "Carbonplace", with the goal of becoming "SWIFT" in the Carbon emission trading market to achieve simple, transparent and safe transfer of certified Carbon credit; ABN AMRO has built an online carbon financial service platform to provide customers with financial services such as financing guarantee, Carbon emission trading consultation and agency trading. The third is to use digital technology to provide solutions for customer management of Carbon footprint. For example, BNP Paribas and Greenly developed the customer Carbon footprint application (Mon Imprente Carbon); HSBC Group and Google Cloud jointly develop customer Carbon footprint tools, etc.

(3)Using digital technology to enhance the carbon management efficiency of financial institutions. Financial institutions in developed countries are strengthening the application of digital technology in carbon management. One is to empower financial institutions to monitor, calculate, and manage their own carbon emissions data. For example, BNP Paribas Asset Management uses artificial intelligence (machine learning) algorithms to calculate the carbon emissions of investment portfolios in the process of carbon accounting. The second is to help improve the efficiency and performance of one's own data center. Data centers are the main source of energy consumption for financial institutions, with data centers around the world consuming approximately 3% of the global electricity supply (with total electricity consumption exceeding that of the entire UK). Digital technology helps data centers operate more effectively. For example, Bank of America utilizes virtualization technology to integrate servers and application systems in data centers, as well as to improve efficiency and reduce energy consumption through the application of green grids. The third is to help improve the climate risk management level of intelligent risk control systems. For example, Citigroup establishes a climate database covering customers and third parties, and applies relevant data to intelligent risk control systems; BNP Paribas used digital technology to innovate in the field of modeling and incorporated climate related risks into the Scenario analysis system.

3 China's Exploration of Empowering Green Finance with Digital Technology

Large financial institutions in China attach strategic importance to technology empowering green finance, actively exploring the use of digital technology to expand green financial service scenarios and improve data center efficiency.

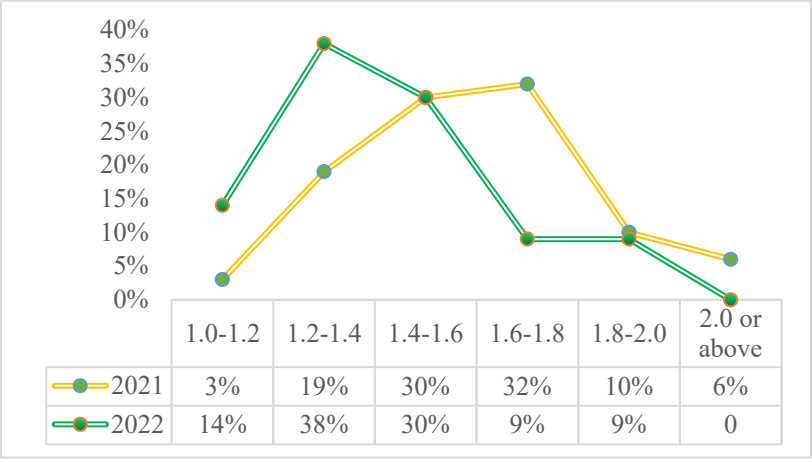
(1) Strategically attach importance to technology empowering green finance. With the strategic goal of "building an internationally leading green bank and becoming a green bank with good international reputation", ICBC has included "innovating a low-carbon, green and sustainable financial service system through financial technology means and financial element management; building a Big data platform for environmental risk information and continuously improving ESG risk management" into its strategic focus. With the strategic vision of "striving to become a leading sustainable development bank in the world", CCB has implemented the "green core"

project of green finance, and built the "five core" of green finance business driving core, product integration core, risk perception core, technology processing core, and responsibility transmission core. Ping An Group has organically integrated the ESG concept into its overall strategic decision-making, actively taking action in five major directions: green operations, green assets, green insurance, green public welfare, and green technology.

(2) Expand green financial service scenarios using digital technology. In recent years, large domestic financial institutions have utilized digital technology to empower green financial services and enhance customer experience. One is to use digital technology to expand the depth and breadth of green financial services. For example, Ping An Group uses AI technology to achieve intelligent matching between customers and products, meet customers' diversified product needs, and develop "Ping An Green Gold" based on Big data, cloud computing and other technologies to achieve real-time monitoring of multi-dimensional data; Industrial Bank built a "turning green into gold" based on Big data technology, focused on energy consumption assessment of key energy consuming enterprises, and took the results as a reference for credit resource allocation. Secondly, multiple commercial banks have launched "personal carbon accounts". For example, the China Construction Bank APP launched a "carbon ledger"; Ping An Bank APP launched "low-carbon home"; China CITIC Bank launched a carbon account based on the "dynamic card space" APP to achieve carbon emission reduction recording, carbon value social sharing, carbon emission calculation and other functions, and introduced electronic credit cards, online payment and other scenarios [6]. The third is to use digital technology to optimize business processes. For example, Ping An Bank enables manual agents through AI technology to improve business efficiency such as green credit and optimize customer experience; Ping An Life Insurance innovated and integrated text recognition extraction (OCR), Natural language processing (NLP), machine learning and other technologies in the underwriting and claims process, assisted data recognition, case review, and improved the efficiency of claims settlement by nearly 20%, significantly reducing user waiting time.

(3)Utilize digital technology to enhance data center efficiency. In recent years, large domestic financial institutions have promoted the optimization and upgrading of data centers to improve efficiency. One is to use cloud computing technology to empower the construction of financial data warehouse platforms. For example, China Merchants Bank built the first large-scale financial core data warehouse based on Huawei Cloud Base in China to support its massive data calculation and concurrent query scenarios, reducing the full link running time of China Merchants Bank's data applications by more than 15%. The second is to focus on optimizing the PUE of the data center (PUE=total power consumption of the data center/power consumption of IT equipment, the closer the PUE value is to 1, the higher the degree of greening of the data center). In 2021, the National Development and Reform Commission, the People's Bank of China, and other ministries and commissions issued documents requiring that the power utilization efficiency (PUE) of newly built large and ultra large data centers should not exceed 1.3; by 2025, the PUE of data centers should generally not exceed 1.5. According to the statistics of PUE values in financial industry data centers,

approximately 82% of data centers had PUE values below 1.6 in 2022. Taking Figure 1 as an example, from the perspective of specific financial enterprises, the PUE value of Industrial and Commercial Bank of China's green data center has decreased from 1.6 (Jiading Phase I) to 1.387 (Jiading Phase II); The Ping An Group Data Center (Anguanlan 3) utilizes technologies such as "multi-layer building stacking indirect evaporative cooling" to reduce the PUE value to 1.248; China Construction Bank has proposed the goal of gradually reducing the PUE value of data centers from 2022 to 2026.



	1.0-1.2	1.2-1.4	1.4-1.6	1.6-1.8	1.8-2.0	2.0 or above
2021	3%	19%	30%	32%	10%	6%
2022	14%	38%	30%	9%	9%	0

Fig. 1. Actual Annual Average PUE Values of Financial Industry Data Centers from 2021 to 2022

According to the "2022 China Data Center Operation Quality Analysis and Development Report"

4 Conclusion

The paper studies typical financial enterprises in developed countries and China, and finds that these financial enterprises are using digital technology to empower green finance. The common practices of financial enterprises include three aspects: The first is making digitization and carbon neutrality important directions for enterprise development strategies; The second is to use digital technology to increase green financial products and improve the efficiency of green financial services; The third is to use digital technology to improve the monitoring and accounting of carbon emissions data for financial enterprises themselves, as well as to reduce energy consumption in data centers.

The practice of using digital technology to empower green finance by large financial institutions can provide the following reflections and insights for the green and low-carbon transformation of the financial industry.

Firstly, seize opportunities of digitization and carbon neutrality. One is to fully research and grasp the opportunities of digitalization and carbon peaking in 2030 and

carbon neutrality in 2060, expand profit growth potential. The second is to strengthen industry analysis and identify the direction of market development. It is recommended that financial enterprises promptly follow up on industry trends, customer demands, and market information changes, and strengthen the theoretical research and practical exploration of digital technology empowering green finance.

Secondly, strengthen the strategic planning of technology empowering green finance. One is to attach great importance to digital management and green development from a strategic perspective, forming a strategic characteristic of green, low-carbon, and technology driven. The second is to empower green finance with digital technology as a key strategic direction, and strengthen forward-looking planning and overall promotion. Third, better play the role of ESG concept in strategic decision-making, and guide enterprises to strengthen digital transformation and green low-carbon transformation.

Thirdly, highlight the purpose of empowering green finance construction with digital technology. Focus on key areas empowered by digital technology and improve resource allocation efficiency. One is to focus on product innovation and enhance the supply of green financial products. The second is to focus on scenario extension, expand the depth and breadth of green financial services, and enhance customer experience. The third is to focus on reducing energy consumption and improving the carbon management efficiency of enterprises themselves.

Fourthly, promote the construction of green finance empowered by digital technology. First, strengthen the application of digital technologies such as artificial intelligence, Big data and blockchain, and expand the spectrum of green financial products. The second is to accelerate the layout of "personal carbon accounts", strengthen the integration of green business and technology, and connect scenarios and systems, forming a good ecosystem for the deep integration of digital technology and green finance. The third is to use digital technology to optimize business processes and enhance customer experience.

Fifthly, use digital technology to improve carbon management efficiency. One is to consolidate the foundation of technological support, explore the establishment of green data centers, green financial data warehouses, ESG data application management systems, etc., continuously promote the reduction of PUE in data centers, and achieve green, low-carbon, and energy-saving operation. The second is to continuously strengthen the agile and intelligent operation of business, data, and technology platforms, and further promote the construction of intelligent risk control systems and risk warning platforms. Third, digital technology is used to strengthen carbon footprint management, strengthen carbon emission data monitoring, create a green and low-carbon business environment, and boost cost reduction and efficiency increase.

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