

Reflections on Digital Finance and Artificial Intelligence Driving Corporate Green Innovation Under the Background of Platform Economy

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Abstract. In the process of advancing the dual carbon strategy, the integration of industrial digitalization and green low-carbon development has become a core direction for the transformation of the real economy, with green innovation serving as a key pathway for enterprises to overcome growth constraints and achieve low-carbon upgrades. Currently, domestic enterprises generally face practical challenges in their green transition, including capital shortages, slow technological iteration, and uneven distribution of innovation resources, making traditional development models inadequate to meet the demands of green industries. Leveraging the advantages of platform economies—such as data integration and supply chain connectivity—digital finance and artificial intelligence are gradually emerging as critical tools to support corporate green innovation. This paper examines the application scenarios within the platform economy, focusing on how digital and intelligent technologies empower green innovation, while identifying current issues such as fragmented industry data standards, significant disparities in enterprise transformation, lagging regulatory frameworks, and underdeveloped market mechanisms. Addressing these pain points, the study proposes improvement strategies in areas including data governance, support for small and micro enterprises, regulatory optimization, and the construction of an innovation ecosystem. The findings offer practical guidance for corporate low-carbon transitions and provide theoretical support for the integration of digital and green development, as well as regional low-carbon, high-quality growth.

Keywords: Platform economy, Digital Finance, artificial intelligence, Corporate Green Innovation, low-carbon transition.

1. Introduction

The high-quality development of the real economy requires dual empowerment from digital innovation and green and low-carbon transformation. The two transformation directions are integrated and advanced simultaneously, completely changing the production mode and market competition pattern of traditional industries. As the core execution entity for green technology research and the implementation of low-carbon policies, enterprises' innovation investment intensity and transformation implementation effect directly affect the progress quality of regional carbon neutrality goals. Domestic traditional financial services have long focused on traditional physical industries, with business models and risk control standards built around traditional production scenarios, making it difficult to adapt to the development characteristics of green innovation projects. Most green projects have long cycles, poor profitability stability, and lack of physical collateral assets, making it difficult to meet the credit approval requirements of commercial banks. Due to considerations of risk prevention and control, financial institutions generally tighten the allocation of green credit, which has led to the widespread problem of difficulty and high cost in green financing in the industry. Compared with large enterprises with sufficient funds, technology, and talent reserves, small and micro enterprises have weaker risk resistance, smaller business scale, and more prominent transformation pressure. This is also the main reason for the generally slow progress of green transformation in small and micro enterprises at present.

The large-scale popularization of platform economy has effectively broken the development bottleneck of green innovation in traditional models. Various industrial platforms deeply integrate into every link of the upstream and downstream of the industrial chain, have accumulated a large amount of real enterprise operation data, covering multiple real scenarios such as production energy consumption statistics, pollutant treatment, supply chain cooperation, and environmental compliance

filing, and can objectively reflect the real level of each enterprise's green transformation. Among various digital tools, digital finance has the highest compatibility with green industries and the most intuitive actual empowerment effect. Digital finance breaks the time and space limitations of traditional credit services, expands the coverage of green funds, and enables small and micro enterprises with funds shortages to conveniently obtain the funds needed for low-carbon transformation. Artificial intelligence deeply integrates into the entire process of enterprise product research, production line operation, and energy consumption intelligent control, providing reliable guarantees for enterprises' refined low-carbon operation and regular technological upgrading. The dual empowerment of funds and technology effectively mobilizes the initiative of various market entities to participate in green innovation, injecting new impetus into the full-scale low-carbon upgrade of the industry [1].

At present, various industries in China are attempting to apply digital and intelligent technologies to green innovation practices, but they are still in the stage of exploration and pilot testing, and have not yet formed a mature operation system that can be replicated on a large scale and implemented stably. Industry shortcomings such as chaotic green data statistics, uneven digital foundations of enterprises, weak adaptability of intelligent algorithm scenarios, and slow iteration of regulatory mechanisms have significantly reduced the empowerment space of digital and intelligent technologies. Based on the real pain points in the industry, this article clarifies the internal logic and existing problems of digital and intelligent technology assisting green innovation, proposes targeted optimization solutions that conform to industry development laws, and provides practical references for the deep integration of industrial digitalization and greenization and the low-carbon transformation of the real economy.

2. The Intrinsic Logic of How Digital And Intelligent Technologies Empower Enterprises in Green Innovation

2.1 Digital Finance Alleviates The Pressure on Enterprises in Green Financing

The issue of funding gap has always been the core pain point that hinders enterprises from conducting green innovation and promoting low-carbon transformation. The traditional banking risk control system is relatively rigid, mainly relying on static data such as the scale of enterprise fixed assets and annual financial statements to assess business qualifications. The approval model is monotonous and the process is cumbersome, unable to adapt to the high-risk, long-cycle, and light-asset operation characteristics of green projects. A large number of high-quality low-carbon innovation projects in the market cannot obtain sufficient credit funds due to the lack of effective collateral and the inability to directly reflect the development value. Many high-quality research and development projects eventually have to be terminated due to the breakdown of the financing chain. The traditional financial model also cannot accurately identify the real transformation behavior of enterprises from their surface-level false rectifications. The problem of information asymmetry in the industry allows some enterprises to engage in arbitrage. These enterprises package false green projects and exaggerate the transformation achievements to obtain policy subsidies and credit funds, directly causing chaos such as waste of green financial resources and imbalance in industry development.

The platform economy optimizes the allocation method of green funds from the data bottom layer and significantly improves the accuracy of investment and financing behavior. The industrial platform collects real-time dynamic operating information such as carbon emissions data, environmental compliance records, and supply chain transaction flows of enterprises. It can fully restore the true operating conditions and low-carbon transformation achievements of enterprises. Financial institutions rely on these multi-dimensional real industrial data to build an exclusive green credit assessment system, including core indicators such as the effectiveness of enterprises' low-carbon production, the proportion of green R&D investment, and carbon emission intensity, and incorporate them into the approval standards to accurately screen out high-quality enterprises that truly focus on

green transformation from the source, effectively curbing illegal behaviors such as greenwashing and profit-making through false rectification. Online digital financial services simplify the cumbersome approval process of traditional credit, reduce the time and capital costs for enterprises to obtain financing, effectively cover small and medium-sized micro-enterprises that traditional finance cannot reach, and effectively alleviate the green financing difficulties of the entire industry.

2.2 Artificial Intelligence Promotes the Iteration of Green Technologies and Low-Carbon Production

Before the widespread adoption of intelligent technologies, the green technology research and development efforts of domestic enterprises were mostly carried out through manual experiments, experience summaries, and repeated trial-and-error. This traditional research and development model was characterized by high costs, low output efficiency, and low tolerance for experimentation. It has long limited the improvement of the green innovation level of the entire industry. With the gradual implementation of artificial intelligence and simulation technologies in industrial scenarios, the traditional extensive research model has been comprehensively optimized. Enterprises can integrate industry patent achievements, cutting-edge technical literature, and mature research plans through digital tools, and simulate and test the actual carbon reduction effects of various new processes, new materials, and new equipment through intelligent simulation systems. They can quickly select more suitable, cost-effective, and more effective transformation plans that fit their production scenarios. The intelligent research and development model significantly shortens the update and iteration cycle of green technologies and effectively reduces the cost of ineffective trial-and-error, providing a solid foundation for enterprises to continuously carry out technological upgrades and establish a low-carbon production system.

The enabling value of artificial intelligence runs through the entire process of enterprise production and operation. Its advantages are most prominent in the two scenarios of energy consumption control and environmental protection governance. The intelligent system can connect with the real-time updated production parameters, energy consumption data, and pollution information on the industrial platform, adjust the operating status of production equipment autonomously, accurately identify the weak links in high-energy consumption and high-emission production lines, and provide a clear direction for enterprise energy-saving renovations. Intelligent monitoring equipment can continuously collect environmental data 24 hours a day, helping enterprises establish a regular green production mechanism and environmental protection control system, effectively avoiding various environmental compliance risks. The massive amount of industry data accumulated by the platform over the long term can also provide reliable data support for financial risk control audits and industry regular supervision, gradually forming a virtuous cycle of industrial development.

2.3 The Platform Collaboratively Builds a Diversified and Green Development Pattern

The traditional green innovation model is mainly based on independent research and development by enterprises, with all the costs and operational risks of technological breakthroughs, equipment upgrades, and model renovations borne solely by the enterprises. This single innovation model has problems such as resource scarcity, information isolation, and low operational efficiency. For small, medium, and micro enterprises with small scales and weak capabilities, the transformation pressure is difficult to bear. Platform economy has extremely strong network collaboration attributes, which can break through the information barriers between government departments, financial institutions, market enterprises, and research institutes, and solve the isolated data, scattered resources, and insufficient collaboration problems that have long existed in the industry. Various industrial platforms integrate and link multiple market entities, create comprehensive service carriers that integrate resource connection, technology sharing, and achievement transformation, and promote the formation of a green innovation development pattern of complementary advantages and coordinated progress in the industry.

After the establishment of the all-chain data interconnection channel, high-quality green innovation resources can be efficiently circulated and quickly shared within the industry. The mature low-carbon technologies, production processes, and management experience of industry leaders can be quickly passed on to small, medium, and micro enterprises through the platform, effectively compensating for the development shortcomings such as insufficient technology, lack of experience, and unclear transformation direction of small and medium-sized enterprises. All market entities can benefit from the platform: financial institutions can optimize green financial products based on real industrial scenarios and match enterprises' individualized financing needs; regulatory authorities can conduct regular and detailed industry supervision based on the dynamically updated massive data. The new model of multi-party collaboration development upgrades the enterprise's green innovation from a single technological breakthrough to a systematic low-carbon upgrade across the entire industry chain.

3. The Existing Problems of Digital And Intelligent Technologies in Enabling Enterprises to Carry Out Green Innovation

3.1 The Green Data Standards Are in a State of Chaos, And The Problem of Data Silos Is Particularly Prominent

Standard and high-quality green data is the core foundation for the implementation and empowerment of digital and intelligent technologies. Data quality directly affects the accuracy of intelligent analysis, credit review, and industry supervision. Currently, there is no unified green data standard across the entire industry in China. Different platforms and different industries adopt significantly different statistical methods and accounting standards. Core green data such as carbon emission data, R&D investment data, and carbon reduction effectiveness data are fragmented and stored separately, making it impossible to conduct unified industry statistics and scientific analysis. Most enterprises have a low willingness to actively disclose green business data. Even if they disclose some information externally, there are often problems such as incomplete content, lagging updates, and data distortion, which cannot meet the usage requirements of precise work such as algorithm training, credit risk control, and in-depth industry analysis. The dual impacts of inconsistent data standards and imperfect sharing mechanisms, combined with enterprises' reluctance to open core data due to commercial confidentiality protection and data security considerations, have led to the ineffective utilization of massive industry data resources. This can easily lead to algorithmic judgment deviations, green fund misallocation, and missed judgments of high-quality projects, significantly weakening the actual empowerment effect of digital and intelligent technologies.

3.2 here is a Significant Digital Gap in the Industry, And the Transformation Capabilities of Small and Micro Enterprises Are Weak

The industry benefits from digital transformation are not distributed evenly in the market. The differences in enterprise scale, digital foundation, and comprehensive strength directly lead to the polarization of the effectiveness of green transformation. Large and leading enterprises have sufficient funds reserves, complete professional talents, and well-developed digital infrastructure. They can independently build intelligent research and development systems and digital control platforms, comprehensively promoting green technology research and the low-carbon transformation of production lines, and fully enjoying the industrial benefits brought by digital transformation. Small and micro enterprises generally face problems such as insufficient funds, weak technology, and scarce professional talents. Their digital foundation is relatively weak, and most can only use the basic transaction functions of industrial platforms and lack the ability to establish a systematic green innovation system. Although digital finance has broadened the green financing channels for small and micro enterprises, after most enterprises obtain special funds, they are often restricted by short-term profit-seeking thinking, technical shortcomings, and unstandardized internal management,

making it difficult to convert the funds into substantive innovation achievements such as green patents, energy-saving processes, and low-carbon equipment. The industry transformation benefits are overly concentrated in large enterprises, directly slowing down the overall progress of the low-carbon upgrade of the entire industrial chain.

3.3 Algorithmic Flaws Coexist With Market Chaos, And Regulatory Adaptability is Insufficient

For intelligent algorithms to operate accurately and stably, they must rely on standardized and sufficient training data. The green industry data itself has problems such as uneven sample distribution and chaotic statistical standards, which directly lead to frequent faults in the algorithms, such as inaccurate judgment and evaluation deviations. Many small and micro enterprises with prominent development potential and high green value are underestimated by the algorithms due to incomplete data dimensions and insufficient data reserves, resulting in missed opportunities for financial support and policy benefits, and causing waste of green financial resources. Under the market-driven profit orientation, some enterprises take advantage of the information asymmetry of the platform, deliberately packaging ordinary projects and fabricating green innovation achievements, and using the method of greenwashing and profit-making to obtain policy subsidies and credit funds, seriously disrupting the normal development order of the green industry. Digital intelligence empowerment belongs to an emerging business model. The iteration speed of technology and operation models is far faster than that of traditional industries. Traditional regulatory systems are updated at a slower pace than the development rhythm of the industry, lacking unified algorithm compliance standards, green project recognition norms, and data usage guidelines. The regulatory work lacks clear implementation basis. At the same time, the existing regulatory model is mainly based on post-event verification and static control, lacking intelligent regulatory means such as dynamic monitoring and pre-warning, making it difficult to quickly identify and rectify various violations such as data fraud, algorithm deviations, and greenwashing by enterprises.

3.4 The Market-Oriented Operation is Not Mature, And The Internal Driving Force of the Industry is Insufficient

The construction of green innovation projects requires significant investment, has a long operation cycle, and yields relatively low short-term economic benefits. They have a stronger ecological and public welfare nature, have a narrower marketization profit space, and are difficult to achieve autonomous and sustainable regular operation. At present, the digital and intelligent green services launched by the platform in cooperation with financial institutions mostly rely on policy guidance and pilot implementation to advance, and have not yet formed a replicable and promotable market-oriented operation model. The initial construction costs of intelligent risk control systems and big data analysis systems are high. Coupled with the long repayment cycle and unstable returns of green projects, this has significantly reduced the market participation enthusiasm of financial institutions and social capital. The market-based incentive mechanism for the domestic green industry is not yet complete, and the investment returns of social capital lack stable guarantees. The industry's development relies long-term on policy support, and it cannot form a market-oriented self-iterative positive cycle. The overall industry's innovation internal driving force is seriously insufficient.

4. Optimize Digital Intelligence Empowerment and Promote The Implementation Path of Enterprise Green Innovation

4.1 Establish Unified Data Standards And Build A Secure and Shared Data System

A well-established data governance system is the core prerequisite for enhancing the quality of digital empowerment. Government departments should take the lead in coordinating and collaborate with industry associations, leading platform enterprises, financial institutions, and research institutes

to formulate unified green data standards across the entire industry. Clearly define the statistical methods and accounting rules for core indicators such as carbon emission intensity, green R&D investment, carbon reduction effectiveness, and environmental compliance records. Standardize the specific contents and update frequency of enterprises' green information disclosure. Relying on cutting-edge digital technologies such as privacy computing, blockchain, and data anonymization, build a universal green data sharing platform and establish a comprehensive data security protection system. While strictly protecting the commercial secrets of enterprises and adhering to the bottom line of data security, break down the data circulation barriers across entities and industries, clearly define the responsibility boundaries for data collection, storage, application, and circulation, eliminate enterprises' concerns about data sharing, and achieve the compliant, secure, and efficient industrial reuse of green data.

4.2 Implement Hierarchical Empowerment To Lower The Transformation Threshold for Small and Micro Enterprises

One-size-fits-all inclusive policies cannot meet the differentiated transformation needs of various enterprises. A stratified and categorized precise empowerment model is more in line with the actual development of industries. Guide leading industry platforms to actively fulfill their social responsibilities, and open lightweight, low-cost, and modular intelligent service tools to small and micro enterprises, covering essential services such as carbon accounting, dynamic energy monitoring, green project assessment, and intelligent risk control, effectively reducing the technical barriers and financial costs for the digital and green transformation of small and micro enterprises. The government should also introduce special subsidy policies to specifically support small and micro enterprises in conducting core transformation work such as green technology research and development, energy-saving equipment renewal, and procurement of digital and intelligent services. Establish a regular talent cultivation mechanism, and conduct specialized training for on-the-job employees of enterprises on digital application and practical operation of low-carbon technologies, steadily enhancing the innovation and transformation achievement capabilities of small and micro enterprises, and gradually narrowing the transformation gap between large, medium, and small enterprises in the industry.

4.3 Establish Collaborative Supervision To Prevent and Control Risks Associated With Industrial Innovation

Based on the development characteristics of the new business forms featuring digitalization, intelligence, and green innovation, a tripartite collaborative supervision system of "government supervision, platform self-governance, and technology empowerment" is established to achieve closed-loop risk management throughout the industrial process. A dynamic algorithm filing and regular compliance review mechanism is established to regularly optimize model parameters and update training samples, effectively avoiding algorithm biases and inaccurate judgments, and ensuring the fairness and accuracy of green project assessment and credit approval. An intelligent dynamic supervision platform is built based on big data and artificial intelligence technologies to monitor the progress of project implementation, the quality of carbon emission data, and the flow of credit funds in real time. Through cross-validation of multi-dimensional data, market violations such as greenwashing and profit-making through manipulation, data fraud, and misappropriation of funds are severely cracked down. Adhering to the principle of inclusive and prudent governance, while strictly adhering to the bottom lines of financial security and ecological security and standardizing market order, reasonable trial-and-error space is reserved for technological innovation and business form iteration, balancing the relationship between risk control and industrial innovation development.

4.4 Optimize The Financial Ecosystem and Cultivate A Market-Oriented Innovation System

The key to activating the internal driving force of the industry lies in breaking away from the sole reliance on policy support and establishing a sustainable and self-renewing market-oriented

development model. Platform enterprises and financial institutions should deepen strategic cooperation, iteratively optimize traditional financial products such as green loans, green insurance, and green bonds, and actively explore new financing models such as carbon asset pledge and green intellectual property pledge. They should enrich the supply of green financial products to meet the diversified capital demands of enterprises in technological research and development, equipment upgrading, and low-carbon transformation. Financial institutions should optimize risk pricing and risk-sharing mechanisms through intelligent algorithms, effectively reducing operational risks and enhancing the participation enthusiasm of various market entities. Based on industrial platforms, they should build an integrated innovation service platform for "government, industry, academia, research, and finance", gather high-quality innovative resources such as policies, capital, technology, and talents, achieve precise matching of scientific research achievements, industrial demands, and financial capital, break through the bottlenecks in the connection between technology implementation and capital empowerment, and build a long-term and stable green innovation industrial cycle.

5. Conclusion

This article focuses on the new scenarios of the platform economy and explores the core digital and intelligent tools of digital finance and artificial intelligence, as well as their enabling value and implementation paths for enterprises' green innovation behaviors. This article summarizes multiple core enabling mechanisms. Digital finance can leverage the data advantages of industrial platforms to alleviate the financing constraints faced by market entities in green innovation. Artificial intelligence can be embedded in the entire industrial production and research chain to continuously optimize the low-carbon production mode and green technology system of enterprises. The multi-party platform collaboration model can restructure the traditional single industrial innovation pattern and fill the resource and information gaps of enterprises' independent transformation. This article summarizes the four current practical pain points of the digital and intelligent enabling models. The industry green data governance system has not been unified, the digital transformation gap in the market persists, the adaptability of traditional industry regulatory systems is weak, and the market-oriented operation mechanism for green industries is not yet mature. This article proposes four-dimensional optimization solutions corresponding to the above industry problems. The solutions cover the establishment of standardized data systems, differentiated layer-by-layer empowerment for small and micro enterprises, the construction of multi-party collaborative supervision, and the cultivation of a market-oriented green innovation ecosystem.

The existing research content still has many areas for expansion. This research takes the macro common characteristics of the industry as the analytical subject. Is it suitable for the heterogeneity development characteristics of sub-sectors and enterprises of different scales? This issue has not been verified. This research mainly focuses on theoretical mechanism analysis and whether quantitative data can directly reflect the enabling effect. This research dimension is still in a blank state. Future research can enrich the research dimensions and perspectives. Micro research data of sub-sectors and empirical measurement models can all be used as core research tools. Researchers can quantitatively calculate the strength, boundary conditions, and applicable scenarios of digital and intelligent enabling. Researchers can also optimize the differentiated implementation strategies for different industries and different entities. The integration of digitalization and greenification of industries is the core trend of the low-carbon transformation of the real economy. Continuously delving into this research direction can improve the relevant theoretical system of green innovation and also provide refined references for enterprise transformation practices and industry policy formulation.

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