

Social credit, green finance, and technological innovation: Basis for enhanced green economy framework

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Abstract

The thesis studies a green economic framework that highlights the outstanding contributions of various dimensions such as social credit, sustainable economy, and innovation in the field of technology to the progress of a sustainable economy. Through empirical research, SPSS data analysis software was used to conduct descriptive statistics and inferential analysis of questionnaire data. A total of 400 respondents participated in the questionnaire of this article, which revealed the current evaluation status of social credit, sustainable economy, and innovation to develop environment-friendly economy and obtain the interrelationship between these green economic factors. Research shows that respondents show no disagreement with the influence of evaluation indicators related to social credit, green finance, and technological innovation on green economic development, and confirms that factors such as credit, transparency, sustainable practices, environment and social governance play a role in shaping social credit and green finance importance. The study also reveals the analysis of the importance of customer satisfaction and technological innovation for companies to gain market competitiveness. Through studies about the relationship between social credit, green finance and technological innovation, the conclusion is that there is a positive and significant connection between social credit, sustainable finance, and innovation in the field of technology. So, social credit contributes to the development of environment-friendly finance and innovation in technology. Good social credit of enterprises will bring higher green financial efficiency and innovation in the field of technology. In the meantime, a strong positive relationship exists between sustainable finance and innovation in technology, that is, the higher the effectiveness of green finance, the greater the influence of technological innovation. This article also constructs a framework for green economic development. The green economic enhancement framework includes social credit, green finance, and technological innovation. Finally, this article provides researchers with suggestions with certain empirical reference significance for promoting the advancement of sustainable economy, laying an important foundation for the subsequent development of environment-friendly economy.

Keywords: social credit, green finance, technological innovation, green economy, framework

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1. Introduction

Employers at present face increasing environmental problems, rapid technological changes, and new challenges to the social credit system. At this moment of intertwined challenges and opportunities, there is an urgent need to establish a sustainable economic development model that can meet human needs while protecting and improving the earth's ecological environment. Social credit, green economy, and technological innovation have become key elements to promote this change, and strengthening the green economic development mechanism has become the cornerstone of achieving sustainable development. Social credit, as a means of social management and governance, not only affects individual behavior, but also relates to the operation and development of society. In the process of building a green economic system, social credit plays an important role of motivating individuals and enterprises to adopt environmentally friendly and sustainable behaviors leading society to move in a more environmentally friendly and sustainable direction (Wang et al., 2017). Research shows that a high level of general social trust forms a vicious cycle with economic development. Meanwhile, lack of trust influences economic development, and may even affect social stability, causing serious consequences. Relative to this, Jiang et al. (2015) manifests that trust plays an indispensably positive part in facilitating China's economic development, especially with the impact of trust on fixed asset investment. Trust is a simplification mechanism of social complexity that has a fundamental impact on economic growth through transactions and division of labor.

The development model of green economy has gradually attracted global attention in the past few years. The green economic development model with the goal of efficient use of resources and reducing carbon emissions not only helps alleviate environmental problems, but also provides a new source of power for economic growth (Volz, 2018). Strengthening the green economic development mechanism is not only a necessary correction to past development methods, but also an important exploration of future sustainable development. Coincidentally, green economy is significantly related to carbon drift and contributes to climate change alleviation by 31.3% (Chang et al., 2021). Correspondingly, technological innovation provides strong technical support facilitating a sustainable economy. From smart environmental protection systems to clean energy technologies, continuous technological innovation is changing aspects of production and lifestyle (Liu, 2023). Through technological innovation and reform, corporate profits can increase, pollution to the environment can be lessened, resources can be utilized more efficiently, and the sustainability of economic development can be enhanced. Taking 137 technology-based small, medium, and micro enterprises in the Shandong Province Innovation Competition while examining the moderating and intermediary effects of social responsibility and green image on green innovation and economic performance gives a better comprehension of the connection between the two (Zhao et al., 2023) where sustainable technology innovation actively contributes to economic income. At the same time, scholars took China's 114 listed manufacturing companies (Ling et al., 2021) where regression methods facilitated study of the relationship between enterprise groups and supply chain networks affecting corporate green economic technological innovation and financial income. The results revealed that the effect of corporate relationship between environment-friendly innovation and economic performance plays a positive moderating role. On the contrary, green finance policies and technological innovation can reduce emissions and thereby promote environmentally sustainable development.

This article delved into the close relationship between social credit, green economy, and technological innovation, and how to achieve constructive interaction in these aspects. Even more, this attempted to propose a sounder green economic development mechanism. By working together, everybody can be beneficiaries of economic prosperity and environmental sustainability, leaving a better future for the upcoming generations.

Objectives of the Study - The thesis concentrates on social credit, green finance, and technological innovation in sustainable economy framework, and explores whether changes in these factors facilitate the progress of a green economy. Specifically, this paper aimed to: Determine the effect of social credit on the advancement of a sustainable economy in terms of trustworthiness, transparency, and sustainable practices. Describe green finance from the perspective of environmental, economic, social, and governance. Assess technological innovations adopted in terms of efficiency, scalability, and environmental impact. Test the significant relationship between social credit, green finance, and technological innovation. Develop a framework that would enhance the green economy.

2. Methods

Research Design - Based on existing theories, this study proposed research hypotheses regarding the effect of social credit, sustainable finance, and technological innovation on an environment-friendly economic framework and constructed a theoretical model. In the model established in this article, social credit, green finance, and technological innovation are set as independent variables, and the green economic framework is used as the dependent variable. A questionnaire survey was designed, and survey data were collected using a combination of online questionnaires and on-site questionnaires. Then the validity and trustworthiness of the data in the questionnaire survey were evaluated and analyzed using factor analysis. Finally, this study uses multiple regression analysis technology to empirically assess the correlation between social credit, green finance, technological innovation, and the green economic framework. This approach aimed to uncover the extent of influence of different dimensions on the green economy and the variations in the importance and impact attributed to these factors by different employees. Lastly, factoring in the results of data testing, this study put forward a series of targeted remedies and recommendations to offer theoretical and practical support for the advancement of a green economy. Drawing on the relevant work of Kaliyadan, et. al., (2019), this study adopted descriptive statistical analysis in the questionnaire design to accurately analyze the demographic characteristics of the research sample. Furthermore, the research used inferential statistical analysis, such as multiple regression analysis (Salvatore, 2021), in the empirical testing to explore the complex relationships between variables. The application of these methods not only enhanced the rigor of the study but also provided effective analytical tools for a deeper understanding of the green economic development mechanism.

Participants of the Study - A total of 400 questionnaires were disseminated through the internet, targeting a diverse group of respondents predominantly from the academic field. The respondents were selected using a randomized sampling approach from 10 universities across five provinces in China: Anhui, Shanghai, Zhejiang, Hubei, and Jiangsu. Each university contributed a sample of 24 faculty members and 24 students or researchers. This allowed the researcher to gather a rich variety of perspectives to ensure a comprehensive understanding of the subject matter pertaining to social credit, green finance, and technological innovation within the academic setting.

Data Gathering Instrument - The survey implemented in this research was devised by carefully selecting dimensions from the domains of social credit, green finance, and technological innovation, organizing it into three distinct sections. Questionnaire items were designed for each dimension of these variables, and responses to the questionnaire were collected using a four-point Likert scale, where 1 represents "strongly disagree", 2 represents "disagree", 3 represents "agree." and 4 means "strongly agree". The questionnaire data consists of two parts, including collecting basic information and detailed demographic information of the respondent participants. The subsequent section was structured around the dimensions and metrics pertinent to social credit, green finance, and technological innovation. The foundation for each section during the development of the questionnaire was as follows: The first part, "Social Credit", involves five aspects including credibility, transparency, and sustainable practices (He et al, 2019). The second part "Green Finance" includes three dimensions: environment, economy, and society and governance (Pan et al., 2018; Mealy et al., 2022; Hickel et al., 2020). Moreover, the third part, "Technological Innovation", has three dimensions: efficiency, scalability, and environmental impact (Qiang et al., 2022; Hao et al., 2023; Cheng et al., 2020).

Reliability outcomes analysis shows that the specific values are trust (0.830), transparency (0.881), sustainable practice (0.853), environment (0.891), economy (0.791), society (0.853), governance (0.848), efficiency (0.858), scalability (0.821), and environmental impact (0.798). Through Cronbach's alpha coefficient, it is concluded that the project performs well in internal consistency. The various areas involved in the study performed well in terms of internal consistency, and the reliability values of most indicators were high, indicating that the design and implementation of the questionnaire were effective. However, some indicators, such as economic and environmental impacts, have reliability that is slightly lower, and further optimization of the design of the questions and investigation methods were needed to improve the accuracy and stability of the measurements. These results provide valuable feedback and guidance for further analysis and improvement of the research instrument

Data Gathering Procedure - The research topic was motivated by prevailing societal trends and scholarly inquiries, with the questionnaire's logical framework being meticulously aligned with the analytical paper's content to gather key empirical data for the study. The distribution of the questionnaire was conducted anonymously via digital platforms such as WeChat and QQ, safeguarding the confidentiality of the survey responses. Prior to the dissemination of the questionnaire through the channels, its content along with the comprehensive thesis proposal required the endorsement of the Graduate School of LPU-Batangas. This step was crucial for initiating data collection from a modest cohort of 20 to 100 participants. In preparation for broader distribution, an initial sample was utilized for a preliminary assessment of the questionnaire's structural reliability and validity. This process was essential to verify the precision and coherence of the questionnaire's design. Feedback from the pre-distribution evaluation of the initial sample prompted adjustments to the questionnaire. These modifications were imperative to refine the tool, ensuring the robustness of the empirical analysis for widespread dissemination.

Data Analysis - In this research, indicators reflecting the varied aspects of the three primary variables were designed and encoded to facilitate the digital structuring of statistical data. This groundwork enabled module evaluation through preprocessing and statistical transformation, paving the way for initial statistical analysis. The comprehensive data analysis in this study used quantitative methods, mainly including descriptive and inferential statistical analysis. At the beginning, the researcher conducted a systematic analysis of three variables. Then, descriptive statistical analysis of the domestic capital characteristics of these variables was carried out through methods such as weighted average and frequency distribution to achieve a comprehensive understanding of the variables. Following this, the interconnections among social credit, green finance, and technological innovation were ascertained using the rho index from correlation analysis. To delve deeper into the dynamics between these variables, regression analysis was made to derive regression coefficients, leading to the construction of a specific regression model for technological innovation, green finance, and social credit. This model laid the foundation for a green economic development mechanism model, culminating in the attainment of the study's ultimate analytical goals. The statistical analyses were processed using SPSS version 28.

Ethical Considerations - Before initiating the study, the conceptual framework and questionnaire underwent a thorough review and received approval from both faculty members and the Graduate School of LPU - Batangas. Before conducting a research survey, the researcher ensured that respondents were fully informed prior to completing the questionnaire and voluntarily agreed to complete the questionnaire. During the investigation, there were no discrimination or prejudice against the respondents because of gender, race, religion, and other factors, and it was guaranteed that the research process will not cause unnecessary harm or adverse impact on the respondents themselves or their families, such as excessive interference with their work or life. Furthermore, the process maintained the privacy and rights of participants, ensured fairness, justice, and transparency in the survey process, and assured that participants may choose their answers independently after consideration.

3. Results and discussion

Table 1 shows the comprehensive impact of social credit on green economic development. This table aims

to explore the comprehensive impact of "social credit on green economic development". The comprehensive average is 3.25, which is within the "Agree" range, indicating that respondents believe that social credit has played a positive role in promoting the development of a green economy. This finding has important implications for understanding the importance of social credit to a green economy and the key influence of enterprises in the development process.

Table 1

Summary Table on Impact of Social Credit in the Framework of the Green Economy

Key Result Areas	Composite Mean	VI	Rank
Trustworthiness	3.19	Agree	3
Transparency	3.27	Agree	2
Sustainable Practices	3.28	Agree	1
Grand Composite Mean	3.25	Agree	

In the evaluation system of green economic development, "Sustainable practices" ranked first with an average score of 3.28, highlighting the importance of enterprises' sustainable behaviors in promoting green economy. This result highlights the expectations and concerns of all sectors of society for enterprises in environmental protection and sustainable development. Businesses does not only need to take measures to reduce their negative impact on the environment in their daily operations, such as reducing waste generation and energy consumption, but also employ continuous and systematic strategies such as adopting clean energy, implementing circular economy models, investing in green technologies, etc. as well as demonstrate its commitment to sustainable development. The implementation of sustainable practices not only provides a positive impact on the environment, reducing resource waste and environmental pollution, but also enhances the market competitiveness and brand image of enterprises. Consumers and investors are increasingly inclined to support companies that demonstrate a keen sense of environmental responsibility, making sustainable practices a key strategy for companies to gain market advantage. Relevant literature, such as the study by Wyrwa et al., (2023) further supports the importance of sustainable practices for green economic development. These studies show that sustainable practices help address current environmental challenges and bring long-term economic benefits to companies and promote the sustainable development of society. Therefore, enterprises should take sustainable practices as core considerations when formulating strategies and decisions to achieve coordinated development of the environment, economy, and society.

Transparency ranked second, with a score of 3.27, and verbal interpretation as "Agree". This highlights the importance of public disclosure and operational transparency in building and maintaining consumer trust. Transparency is a key component of corporate social responsibility and a key factor in building long-term customer relationships and attracting more environmentally conscious consumers. In green economic development, "Trustworthiness" ranks third with a score of 3.19. Although the score is low, its importance cannot be underestimated. Establishing an image of integrity, transparency, and responsibility, in addition to strengthening communication and interaction with stakeholders helps companies gain a more favorable competitive position in the fiercely competitive green market. As consumers and investors' demand for green products and services continues to increase, a company's credibility has become one of the key factors affecting its market share and earnings. A company's reputation directly affects its brand image and market position, and it is crucial to gain an advantage in the highly competitive green market. Although credibility has a slightly lower average score, it still plays a key role in driving green economic development. Credibility is not only a metric based on the trust of consumers and investors, but also a social contract established between enterprises and society. In a green economy, corporate credibility requires gaining trust in the quality of products and services, while also demonstrating commitment to and practice of environmental protection and social responsibility. Relevant research shows that the credibility of an enterprise is closely related to its competitiveness in the green market, and this competitiveness directly affects its status and development in a green economy. Li et al. (2021) emphasizes the important impact of corporate credibility on a green economy.

In the process of promoting the development of green economy, all dimensions of social credit play a key role, covering aspects such as credibility, transparency, and sustainable practices. Businesses need to strike a balance between these aspects to ensure their own sustainable development and promote the health and sustainability of the entire green economic ecosystem. Therefore, in future strategy formulation, companies should consider these key areas as important drivers of green economic development to achieve long-term success and sustainable growth. Future research can further explore the interaction between different social credit dimensions and their long-term impact on green economic development, thereby providing guidance for enterprises to formulate more precise and sustainable strategies (Almazrouei et al., 2021; Navas et al., 2021).

Table 2

Summary Table on Green Finance

Key Result Areas	Composite Mean	VI	Rank
Environmental	3.28	Agree	1
Economic	3.24	Agree	2
Social	3.21	Agree	3
Governance	3.19	Agree	4
Grand Composite Mean	3.23	Agree	

Table 2 aims at offering a comprehensive evaluation of the influence exerted by green finance on the four pivotal dimensions: environmental, economic, societal, and governance aspects. As a crucial instrument for fostering sustainable development, green finance has been the subject of extensive attention due to its significant contributions across these diverse sectors. The table shows the weighted mean (WM) and verbal interpretation (VI) of each dimension. Taken together, the overall comprehensive average of each dimension is 3.23. Analysis of these data shows the multi-faceted impact of green finance on the environment, economy, society, and governance, providing important insights for the government to formulate future green finance policies. By analyzing various dimensions, a comprehensive understanding of the benefits and challenges of green finance in various fields is acquired thereby promoting the sustainable development of a green economy.

The environmental dimension plays an especially important role in a green economy, with a comprehensive score of 3.28, showing the key role of green finance in promoting environmental sustainability (Iqbal et al., 2021). Research shows that green finance makes a very significant contribution as climate change and natural resource protection receive increasing attention. Implementing green finance measures is important to strengthen environmental protection and advance the goals of sustainable development. In terms of economic development, Green Finance received a score of 3.24, ranking second, indicating its positive impact on economic growth and stable returns. This is consistent with the findings of Peng, et al. (2018), which emphasizes that green finance contributes to environmental protection and economic prosperity through sustainable investment opportunities. The social and governance dimensions have slightly lower scores, 3.21 and 3.19 respectively, ranking third and fourth, indicating that relative to environmental and economic impacts, the contribution of green finance to social welfare and governance structures still needs to be strengthened (Zhang et al., 2021; Li et al., 2021).

The economic dimension ranks second with a weighted average of 3.24 and is classified as "Agree". The social dimension ranked third with a weighted average of 3.21, also classified as "Agree". The governance dimension ranks fourth with a weighted average of 3.19, also classified as "Agree". These scores indicate that green finance performs satisfactorily across economic, social and governance dimensions, but there is still room for improvement. The score of the governance dimension is 3.19, which is at the lowest position among the four dimensions, that implies recognition of governance structure of green finance is not high enough. However, further analysis on why the performance of the governance dimension lags other dimensions is needed. Such differences may involve aspects like the degree of sophistication of regulatory frameworks, the flexibility of institutional arrangements, and the degree of stakeholder participation. Chao (2023) emphasizes in his study the importance of incorporating governance factors into green finance strategies, which can help achieve the goal of

comprehensive sustainable development. Therefore, increasing attention to and improving the governance dimension is a key step in promoting green finance to achieve a wider impact. The study highlights the need to balance green finance initiatives across four dimensions: environmental, economic, social and governance. This means that to achieve comprehensive sustainable development outcomes, multiple SDGs must be addressed simultaneously and contribute to broader social and governance concerns. The tabular analysis highlights the interrelationships between these dimensions and the need for a comprehensive approach to maximize the potential of green finance in promoting sustainable development (Wang et al., 2024). This comprehensive approach ensures that green finance initiatives are robust and inclusive and aligns them with broader sustainable development goals (Zeng et al., 2024). Therefore, comprehensive considerations across multiple dimensions are critical to ensuring the effectiveness and long-term sustainability of green finance.

Table 3

Summary Table on Technological Innovation Adopted

Key Result Areas	Composite Mean	VI	Rank
Efficiency	3.15	Agree	2
Scalability	3.17	Agree	1
Environmental Impact	3.11	Agree	3
Grand Composite Mean	3.14	Agree	

Table 3 is titled "Summary Table on Technological Innovation Adopted", which systematically evaluates the application of technological innovations in three key areas: efficiency, scalability, and environmental impact. This assessment aims to gain an in-depth understanding of the performance of technological innovation in different fields and provide an important reference for future technological development and application. The overall comprehensive average is 3.14, verbally interpreted as "agree", shows that technological innovation is recognized and regarded as an important engine to promote social development. This assessment provides insights that allow a better understanding of the actual effects of technological innovations in different fields and point the way for future technological development and applications.

In Table 3, the weighted average score of the scalability indicator is 3.17, ranking first among all indicators. The analysis shows that green technology innovation performs very well in expanding the scope of applications and attracting more stakeholders to participate. At the same time, the research results emphasize that green technology innovation has broad applicability in various fields and has made important contributions to sustainable development (Lee et al., 2022). Ahakwa, et al. (2023) further affirmed the key role of scalability, showing that green technology innovation significantly affects stakeholder attractiveness. Scalability emerges as a major factor in the success of green technology innovations, providing valuable insights into future technological advancements. Emphasis on scalability and adaptability is crucial to ensure the successful implementation of green technologies in different sectors. Secondly, the weighted average of the efficiency indicator is 3.15, ranking second, slightly lower than scalability. This shows that green technology innovation is valued in improving resource utilization efficiency, highlighting its potential to optimize resource utilization and improve operational efficiency. At the same time, the weighted average of environmental impact indicator is 3.11, ranking third. Ranks 2 and 3 are both verbally interpreted as "Agree".

In Table 3, the lowest indicator is environmental impact, with a weighted average of 3.11, ranking third. Although the score is low, it still shows the positive role of green technology in reducing environmental impact. However, environmental impact scored slightly lower compared to other indicators, suggesting there is still room for improvement. This may require further optimizing technological innovation and strengthening the formulation and implementation of environmental protection policies to improve the actual effect of green technology in environmental protection. Researchers Qiang et al. (2022) also emphasized the need to strengthen environmental protection efforts to ensure the environmentally sustainable development of green technology innovation. Therefore, for low scores in environmental impact indicators, discernment is needed to take further

actions to ensure that green technology innovation plays a greater role in environmental protection (Jin et al., 2023).

Taken together, it can be clearly seen from the results in Table 3 that green technology innovation has significant positive impacts and huge development potential in different fields. By improving efficiency, expanding scalability, and reducing environmental impact, green technology innovation provides important support for the realization of sustainable development goals (Xu et al., 2023). However, despite some progress, a series of environmental challenges prevails. Particularly, there is room for improvement when it comes to improving environmental impact. Environmental problems are one of the major challenges faced by the world today, and taking more active actions to solve these problems is important. Therefore, strengthening in-depth research and discussion to find practical solutions are recommended. This may involve further promoting technological innovation, strengthening the formulation and implementation of environmental protection policies, and promoting cooperation and consensus among all sectors of society. By working together, overcoming environmental challenges ensures that green technology innovation plays an important and effective role in achieving sustainable development and protecting the global environment (Wu, et. al., 2023).

Table 4

Relationship Between Social Credit and Green Finance

Variables	rho	p-value	Interpretation
Trustworthiness			
Environmental	0.272**	<.001	Highly Significant
Economic	0.328**	<.001	Highly Significant
Social	0.254**	<.001	Highly Significant
Governance	0.296**	<.001	Highly Significant
Transparency			
Environmental	0.304**	<.001	Highly Significant
Economic	0.316**	<.001	Highly Significant
Social	0.253**	<.001	Highly Significant
Governance	0.387**	<.001	Highly Significant
Sustainable Practices			
Environmental	0.290**	<.001	Highly Significant
Economic	0.332**	<.001	Highly Significant
Social	0.336**	<.001	Highly Significant
Governance	0.347**	<.001	Highly Significant

In Table 4, the “sustainable practices” indicator is highlighted with a rho value of 0.332, indicating a close positive correlation with green finance in the social credit system. This shows that companies that adopt sustainable operating and management practices can not only improve their own environmental performance, but also promote the continued development of the financial system in a green economy, thus driving the entire society towards the goal of sustainable development. Meo, et al. (2022) further explored the positive impact of sustainable practices on corporate environmental performance and the contribution of these practices to the realization of green finance. Their research highlights the key role of sustainable practices in promoting regional green transformation and green financial growth, providing companies with new ways to achieve rapid green economic growth. Therefore, strengthening the research and promotion of sustainable practices is significant to promoting the development of green economic and financial policies and achieving sustainable development goals.

Among the indicators between the second and fourth positions, the areas of transparency and governance show significant positive correlations across aspects, with rho values of 0.387 and 0.347 respectively. This shows that there is a close connection between social credit in terms of transparency and governance and green

finance, which may be attributed to transparency and effective governance mechanisms that can enhance the confidence of financial institutions in green projects, thereby promoting the development of green finance. In the study of the relationship between social credit and green finance, the weighted average of the "social" indicator is relatively low, with a rho value of 0.254. Although this correlation is not as significant as other indicators, it still reveals a certain degree of positive correlation between social factors in social credit and green finance. This shows that social factors, such as corporate social responsibility, public participation, and community support, still have influence on the development of green finance. This impact may be reflected in the social credibility gained by companies through fulfilling social responsibilities, thereby attracting more green investment and financial support.

Research shows that social factors play a crucial role in promoting the development of green finance, especially in improving corporate transparency, enhancing stakeholder trust, and promoting social and environmental responsibility (He et al., 2019). Therefore, comprehensive, and in-depth research on the role of social factors in green finance is practically significant for deepening the practice of green finance. The research results show that there is a significant positive correlation between each dimension, providing an important empirical basis for further exploring the interaction between social credit and green finance. Therefore, strengthening research on the relationship between social credit and green finance provides a theoretical basis for promoting the development of green finance and achieving sustainable development of society.

This study provides important value for in-depth understanding of the complex relationship between social credit and green finance. The concept of social credit is not only reflected at the individual level, but also involves the social credit evaluation of institutions and countries (Alnafrah et al., 2023). As a financial innovation policy, green finance not only meets financial needs, but also considers environmental, social and governance factors in investment projects to promote social coordination and sustainable development (Mehmooda et al., 2024). Therefore, further studies on the causal relationship between social credit and green finance, as well as the differences under different cultures, systems, and developments, will be an important direction for future research, which will help promote innovative reform and development in financial field, and contribute to the realization of sustainable development as well as provide policy recommendations on the Sustainable Development Goals.

Table 5
Relationship Between Social Credit and Technological Innovation

Variables	rho	p-value	Interpretation
Trustworthiness			
Efficiency	0.351**	<.001	Highly Significant
Scalability	0.314**	<.001	Highly Significant
Environmental Impact	0.262**	<.001	Highly Significant
Transparency			
Efficiency	0.316**	<.001	Highly Significant
Scalability	0.362**	<.001	Highly Significant
Environmental Impact	0.280**	<.001	Highly Significant
Sustainable Practices			
Efficiency	0.229**	<.001	Highly Significant
Scalability	0.274**	<.001	Highly Significant
Environmental Impact	0.283**	<.001	Highly Significant

Table 5 explores the relationship between social credit and technological innovation. Table 5 describes the correlation between the social credit sub-dimensions (integrity, transparency, and sustainable practices) and the technological innovation dimensions (efficiency, scalability, and environmental impact). The study used rho values (correlation coefficients) and p values (significance levels) to determine the strength and significance of

these associations. The overall composite average shows the overall trend and magnitude of these relationships, which is critical to the understanding of how social credit affects technological innovation. These indicators help conduct an in-depth analysis of the relationship between social credit and technological innovation and provide references for the sustainable development of society.

The indicator with the highest weighted average is the correlation between transparency and scalability (rho value is 0.362), indicating that there is a positive correlation between social credit transparency and technological innovation scalability. As the transparency of social credit increases, the scalability of technological innovation increases accordingly. Research by He et al. (2019) supports this finding, emphasizing the importance of transparency in promoting technological innovation and growth. Therefore, exploring the impact mechanism of transparency on the scalability of technological innovation is crucial to understanding the impact of social credit on technological innovation (Asimakopoulos et al., 2023). Among the second to fourth indicators, the correlation between sustainable practices and efficiency has a weighted average of 0.229. This shows that although sustainable practices in social credit show a certain positive correlation with the efficiency of technological innovation, this relationship is relatively weak. This result hints at possible challenges in leveraging sustainable practices to drive improvements towards technical efficiency. However, the nature of these challenges and ways to overcome these obstacles still require further research.

The indicator with the lowest weighted average is the correlation between sustainable practices and scalability, with a rho value of 0.274. Although this correlation is still highly statistically significant, it is the weakest relative to the other dimensions. This suggests that the need to have a deeper understanding of the impact mechanism of sustainable practices on the scalability of technological innovation. The study by Chen et al. (2019) mentions how sustainable practices affect technological innovation, but there are still many unsolved issues, such as how to establish a stronger correlation between sustainable practices and technological innovation to promote sustainable development target (Allen et al., 2021). For the dimensions that are significantly correlated in Table 5, a more in-depth explanation is provided. The correlation between transparency and scalability demonstrates the importance of transparency for technological innovation (Sun, 2019). On the other hand, the connection between sustainable practices and efficiency poses challenges that require further research and exploration.

Table 6
Relationship Between Green Finance and Technological Innovation

Variables	rho	p-value	Interpretation
Environmental			
Efficiency	0.244**	<.001	Highly Significant
Scalability	0.373**	<.001	Highly Significant
Environmental Impact	0.322**	<.001	Highly Significant
Economic			
Efficiency	0.349**	<.001	Highly Significant
Scalability	0.342**	<.001	Highly Significant
Environmental Impact	0.376**	<.001	Highly Significant
Social			
Efficiency	0.193**	<.001	Highly Significant
Scalability	0.335**	<.001	Highly Significant
Environmental Impact	0.325**	<.001	Highly Significant
Governance			
Efficiency	0.285**	<.001	Highly Significant
Scalability	0.344**	<.001	Highly Significant
Environmental Impact	0.374**	<.001	Highly Significant

** . Correlation is significant at the 0.01 level

Table 6 provides a detailed analysis of the correlation between green finance and technological innovation. The overall composite average shows correlations between the various areas of green finance (environmental, economic, social and governance) and the three dimensions of technological innovation (efficiency, scalability and environmental impact). The results show that there is a certain degree of positive correlation between green finance and technological innovation, although the strength of the correlation varies across different fields and dimensions. All P values were below 0.001, emphasizing the statistical significance of these associations, although overall the strength of their correlations was weak. This shows that green finance plays a certain role in promoting technological innovation, especially in promoting technological innovation with significant environmental impact. In Table 6, we observe that the indicator with the highest weighted average demonstrated the correlation between the economic sector of green finance and the environmental impact dimension of technological innovation, with a rho value of 0.376. This finding suggests that economically successful green finance projects tend to have a closer correlation with technological innovation, especially technological innovation with significant environmental impacts.

As for the reason related to economic field that has the most significant impact in green finance, this may result from economic investment and resource support which are more conducive to promoting technological innovation, thereby producing more significant environmental impacts. Economic sectors tend to have more funds and resources and can invest in the research, development, and implementation of technological innovations, leading to achieving more significant results in the environment. Relevant literature supports this view. According to Zhou et al. (2020), investments in economic sectors tend to involve more technological innovations, especially those that have a significant impact on the environment. Iqbal, et al. (2021) also pointed out that there is a positive association between economic success and environmental impact innovation, which further supports the close relationship between the green financial economic sector and environmental impact technological innovation. Therefore, the significant impact of the economic sector in green finance may be driven by a stronger investment and resource support, which helps drive technological innovation and generate greater environmental impact.

Table 6 shows the correlation analysis between green finance and technological innovation, including the four main areas of environment, economy, society, and governance, then the three dimensions of efficiency, scalability, and environmental impact of technological innovation. The correlation coefficients (rho values) range from 0.193 to 0.374, showing levels of correlation from very weak to weak. All P values are below 0.001, highlighting the statistical significance of these associations, although overall they are weak. It is particularly worth noting that among the economic sectors, the correlation between green finance and the environmental impact dimension of technological innovation is the strongest (rho value is 0.376), ranking first. The social and governance sector ranks between 2nd and 4th. The specific correlation coefficients are efficiency of the social sector is 0.193 (ranks 4th), scalability is 0.335 (ranks 2nd), and environmental impact is 0.325, ranks 3rd; the efficiency of governance department is 0.285 (ranks third), the scalability is 0.344 (ranks second), and the environmental impact is 0.374 (ranks first). The intermediate variables indicate a range from moderate to high statistical significance, underscoring the pivotal role of social and governance factors in the interplay between green finance and technological innovation. Consequently, these findings underscore the imperative for comprehensive research into the intricate relationship between green finance and technological innovation. Such in-depth exploration is essential to fully grasp its dynamics and specific implications, thereby facilitating progress towards achieving Sustainable Development Goals

By analyzing the data in Table 6, it is revealed that the social sector has a low correlation between green finance and technological innovation, showing a weak association. Specifically, the efficiency indicator of the social sector ranks fourth, with a specific correlation coefficient of 0.193, showing a low correlation compared to other sectors. This finding is consistent with corresponding literature support. According to Iqbal et al. (2021), the social sector may face challenges such as insufficient resource allocation, low social recognition, and insufficient legal framework support, thus limiting its close connection between green finance and technological

innovation. These challenges may hinder the development and influence of the social sector in the fields of green finance and technological innovation. Therefore, it is necessary to delve deeper into the role and influencing factors of the social sector to promote its connection with technological innovation, thereby promoting more comprehensive and effective green financial development and making greater contributions to the realization of the sustainable development goals.

By analyzing the relationship test table, it presents that there is a significant positive correlation between environmental impact and green finance, with the rho value exceeding 0.3 and the P value below 0.001, indicating the statistical prominence of this relationship. For example, Zhou et al. (2024) suggests that environmentally friendly green financial investment projects tend to receive more investment projects, thereby promoting technological innovation. In addition, Liu (2023) found that the greater the environmental impact of a green finance project, the stronger its long-term sustainable development. Therefore, this study highlights the central role of environmental impact in green finance and its positive impact on advancing the development of the green economy.

In summary, the findings in Table 6 strongly underlines the role of sustainable economy in facilitating innovation in the field of technology, particularly in driving technological advancements with significant environmental impact. The analysis calls for more in-depth research to explore how green finance can effectively drive technological innovation that contributes to achieving the Sustainable Development Goals. It reinforces the need for targeted research and reveals the specific ways in which green finance affects technological progress.

Proposed Green Economy Framework

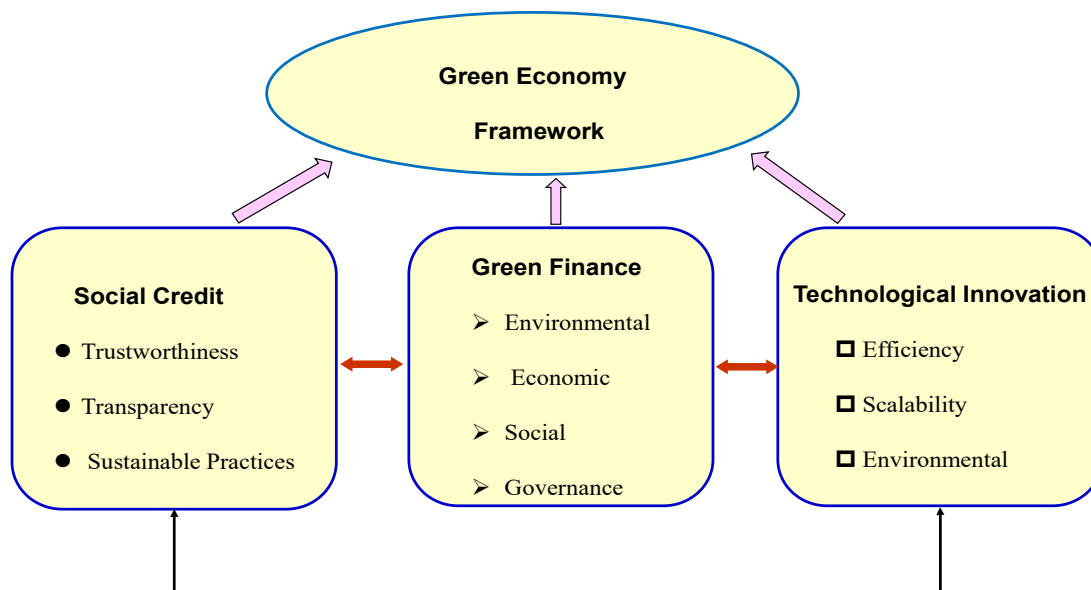


Figure 1. Framework for Enhanced Green Economy

This article starts from three key indicators of social credit, green finance, and technological innovation, and explores how they work with each other to facilitate the advancement of green economy (Mealy et al., 2022). In the current context of global climate problem and environmental degradation, the global consensus is building a greener, lower-carbon, and more sustainable economic system. A green economy not only involves environmental protection, but also includes economic growth and social progress. Therefore, finding a balance between enhancing social credit, promoting green finance, and stimulating technological innovation is a core issue in achieving green economic transformation. Shown in Figure 1 is the green economic development model diagram. In the constructed model diagram, social credit is the foundation. It provides support for enterprises to establish a positive image in the green economy by enhancing the credibility of enterprises and the transparency of the market. The improvement of credit can help reduce the cost for enterprises to obtain funds, especially in

the field of sustainable finance. Sustainable finance provides motivation and resources for enterprises to invest in technological innovation by providing financial support that focuses on environmental and social benefits. Innovation in technology is instrumental in the model. It directly facilitates the advancement of green finance by improving production efficiency, reducing environmental costs and expanding market application scope. These three indicators interact and promote each other, and together they constitute a powerful mechanism to facilitate the advancement of green finance. They not only promote the sustainable development of the environment, but also bring long-term economic benefits to enterprises and society.

The analytical model shows how social credit, green finance, and technological innovation work with each other in a green economic system, and how they jointly promote the green reforms of the economy and the continuous improvement of the environment through interaction and interdependence. This holistic understanding helps policymakers, business leaders and investors make more informed decisions as they advance a green economy.

4. Conclusions and recommendations

Respondents moderately agreed that social credit is instrumental in the advancement of green finance, the three dimensions of trustworthiness, transparency, and sustainable practices all positively affect the development of a sustainable economy. Respondents moderately agreed on the significance of sustainable economy in alleviating environmental problem, promoting economic benefits and enhancing social responsibility. Respondents moderately showed agreement on the conclusion that the use technological innovation resulted to operating efficiency, expanding market applications, and reducing environmental impact, as well as technology innovation is the key to building an efficient and environmentally friendly economic system. The results revealed that there exists a high positive relationship among social credit, green finance, and technological innovation. A framework has been developed to enhance green economy.

Enterprises may strengthen social credit construction, improve credibility and transparency through management, and ensure openness and transparency of business behaviors and sustainable practices to enhance the trust of the public and investors. Enterprises may actively use sustainable financial tools, say issuing sustainable disciplines or investing in sustainable projects, to finance innovative environmental protection strategies, and comprehensively consider the impact of the environment, economy, society, and governance. Enterprises may prioritize technology research and development investments that can improve energy efficiency, have scalability, and low environmental impact to facilitate the advancement of sustainable economy. The framework may be adopted to enhance their position in the green economy. Similar study may be conducted by researchers in the future focusing on consumers' environmental awareness and how government green policies interact with social credit to influence the promotion of green finance and technological innovation.

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