

Retraction

Retracted: Performance of Sustainable Development and Technological Innovation Based on Green Manufacturing Technology of Artificial Intelligence and Block Chain

Mathematical Problems in Engineering

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

- (1) Discrepancies in scope
- (2) Discrepancies in the description of the research reported
- (3) Discrepancies between the availability of data and the research described
- (4) Inappropriate citations
- (5) Incoherent, meaningless and/or irrelevant content included in the article
- (6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their

agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] X. Jiang, G. Lin, J. Huang, I. Hu, and Y. Chiu, "Performance of Sustainable Development and Technological Innovation Based on Green Manufacturing Technology of Artificial Intelligence and Block Chain," *Mathematical Problems in Engineering*, vol. 2021, Article ID 5527489, 11 pages, 2021.

Research Article

Performance of Sustainable Development and Technological Innovation Based on Green Manufacturing Technology of Artificial Intelligence and Block Chain

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The powerful advanced manufacturing industry is the most powerful driving force for economic development and growth, and it is also the main source of environmental pollution. Artificial intelligence and blockchain technology are recognized as a breakthrough technology that can be widely used, changing the way the entire society and economy operate. The main constraints affecting the sustainable development of the manufacturing industry are ecological deterioration and resource shortage, but the development of artificial intelligence and blockchain technology provides new ideas for solving manufacturing problems. Based on this, this paper proposes a research on the sustainable development performance of green manufacturing technology innovation based on artificial intelligence and blockchain technology. This paper deeply grasps the essence and connotation of artificial intelligence and blockchain technology, analyzes its specific application form and research background, searches for the effective effect of manufacturing technology innovation and green manufacturing performance path, and clarifies the mechanism between the two. All measurement items in the questionnaire used in this article use Likert5 scale and use 1–5 options to indicate the degree of conformity with the actual situation of the enterprise. The results show that the average green manufacturing capacity of each measurement item is between 3.18–3.97, indicating that the company's green manufacturing capacity is relatively high. Among them, the ability of green technology innovation is relatively high, indicating that most companies have noticed that the improvement of the ability of green technology innovation plays a vital role in the future sustainable development of enterprises. Moreover, more and more companies are paying attention to the latest applications of blockchain technology, which can effectively promote the development of enterprises.

1. Introduction

Developing a green economy has become a global consensus [1]. The development of green economy needs the support of green technology to guarantee the coordinated development of environment and economy [2]. This is because, compared with traditional technology, green technology can greatly alleviate the unnatural and mechanical color of traditional technology and effectively resist the negative effect of technology on the natural ecosystem. Therefore, without green technology innovation, there can be no sustainable development in a real

sense [3]. Green innovation has become the inevitable choice of future technological innovation [4]. This is especially true of fast-growing China. A country's green technology development level, in the final analysis, mainly depends on the green technology innovation ability of enterprises. However, where does the green technology innovation capability come from? Existing studies show that compared with traditional innovation driven by market mechanism, green technology innovation faces many obstacles and difficulties [5]. Therefore, the study on the formation mechanism of enterprises' green technology innovation ability can help open the "black box" of

green innovation ability of economic subjects under the influence of complex factors from the microlevel [6]. At present, global enterprises are in a highly competitive environment, in which hegemony is undoubtedly a fulcrum for sustainable development. To achieve this goal, enterprises need to conduct systematic and comprehensive management in an excellent way to overcome the huge competitive environment faced by the globalization environment. Logically speaking, through the implementation of green management that is interwoven with technology and jointly formulated and implemented, enterprises, especially the manufacturing industry, can maintain the status quo of sustainable development and surpass competitors [7, 8]. In the new normal economy, manufacturing industry, as the focus of economic development, is developing rapidly. Its rapid development has not only brought great opportunities to our society but also brought great challenges to the natural environment [9]. Resource consumption and environmental pollution are becoming more and more serious. Faced with this situation, we must make every effort to reduce pollution and save energy [10]. Therefore, the future transformation trend of the manufacturing industry is bound to take green economy as the background.

Green manufacturing is an important way for enterprises to achieve breakthrough and sustainable development. For the manufacturing industry, the availability and level of green manufacturing capability will become the key for enterprises to obtain competitiveness and also the entry point to evaluate the green performance of enterprises [11]. Green manufacturing is a complex model of modernization. The formation of green manufacturing capacity is a dynamic process, which is closely related to the economic benefits, social benefits, and potential development opportunities obtained by enterprises [12]. Therefore, it is of great theoretical and practical significance to study the green manufacturing capability of enterprises [13]. In the theoretical sense, at present, the research on green manufacturing has not formed a systematic and complete theoretical framework. This paper takes green manufacturing as the research object, discusses the connotation and constituent dimension of green manufacturing from the perspective of dynamics, and constructs the influence mechanism of green manufacturing ability on green manufacturing performance. The model is used for verification to further improve the theoretical system of green manufacturing and expand the depth and breadth of research. To a certain extent, it is a further enrichment of the current theoretical system of green manufacturing research. In practical sense, the in-depth and systematic analysis of the green manufacturing theory will help manufacturing enterprises find the key factors to improve the green performance, break through the limitations of the original production mode, improve the green manufacturing capacity, and enhance the competitive advantage of enterprises. In addition, by constructing a mechanism model, it helps to realize the simplification and operability problems of complex abstractions, so as to help enterprises understand the current situation and deficiencies of green manufacturing capacity, and clarify their improvement goals and directions, so as to cultivate and improve green manufacturing capacity in targeted ways. Therefore, the study of green manufacturing

theory will help accelerate the green development process of manufacturing enterprises, realize sustainable development, and ultimately improve the comprehensive competitiveness of China's manufacturing industry [14].

As the conceptual basis for understanding green technology innovation ability, people have made a very deep discussion on technology innovation ability since 1980s. From the perspective of strategy, it defines the capability of technological innovation, that is, the comprehensive capability of supporting enterprise strategy. Barton believes that the core of an enterprise's technological innovation ability is the ability to master professional knowledge, technical system, management system, and corporate values. These definition methods mainly put forward the connotation and characteristics of technological innovation ability from the descriptive angle. Although the above opinions provide semantic basis for understanding green technology innovation ability [15], the definition of green technology innovation ability in the academic circle has not yet formed a unified explanation. Based on the existing literature, there are three main innovative understandings of green technology. First, green technology innovation capability is defined as the ability to minimize environmental damage in the production process. Green innovation capabilities are technologies and processes used to reduce environmental pollution, raw materials, and energy consumption and the ability to produce green products [16]. Second, green technology innovation ability is the ability to introduce ecological concept into technology innovation. Third, green technology innovation capability is considered as a comprehensive capability system composed of multiple elements. Green innovation capability includes Green R & D Capability, green manufacturing capability, and green market development capability.

This paper analyzes the problems in the manufacturing industry, the status quo of traditional manufacturing enterprises, and the advantages of green manufacturing. Therefore, this paper intends to comb and analyze relevant literatures at home and abroad in recent years, in an attempt to provide useful reference for the formation of a more systematic and general theoretical research model in the future, adopt the method of combining theoretical research and empirical analysis, in-depth grasp the nature and connotation of green manufacturing ability, analyze its concrete form dimensions, to explore the role of green manufacturing capability of enterprise green manufacturing performance path, clear the action mechanism between them, for the enterprise to obtain or to improve the green manufacturing capacity, improve enterprise performance provides concrete suggestions and measures, and effectively improve the whole strength and manufacturing competitive advantage.

2. Proposed Method

2.1. The Dimension and Mechanism of Green Manufacturing Capacity

2.1.1. *Dimension Analysis of Green Manufacturing Capability.* At present, the division of green manufacturing

capability is mainly carried out from the internal and external perspectives of enterprises, and different dimensions are brought about by different research perspectives. Through data borrowing, it is considered that the classification of green manufacturing capability should reflect the green degree of product life cycle. Taking enterprises as the boundary of green manufacturing capability research, it mainly extracts the internal factors of enterprises and highlights the impact on green performance [17]. Through literature review and comparison, the company's green manufacturing capability includes green design capability, green technology innovation capability, and recycling capability. Green design capability is the foundation of green manufacturing. The concept of green manufacturing is implemented in green design to meet the requirements of the market and the environment. The enterprise can establish the first mover advantage; the innovation ability of green technology is the important support of the whole green manufacturing process. The emergence of materials, new technology, new technology, new packaging, and green design feasibility transformation are inseparable from technological innovation. Recycling capacity is the ability to manage the end of a product, convert waste into resources, and remanufacture the product as a raw material. Through the coordinated development of the three, jointly promote the green manufacturing capacity.

2.1.2. Mechanism of Action of Green Manufacturing Capacity on Green Performance. Green manufacturing ability is a complex dynamic capability and dynamic capability of resource configuration of cost, time, and efficiency and has direct effect on corporate performance, and in this process, the enterprise organizational structure and organizational system can have the effect of promotion and coordination and can give full play to the coordinating role of the main structure depends on the organization structure. The flexible organizational structure can be adjusted flexibly, efficiently, and reasonably according to the change of the external environment, so as to reduce the negative impact of uncertainty on the enterprise as much as possible. Organizational structure and system can play a coordinating role in the path of dynamic capability to enterprise performance [18]. This article follows the dynamic ability to enterprise performance path, namely, the dynamic capability of effect on enterprise performance through organizational structure and system, and puts forward some ideas of enterprise green manufacturing capacity analysis, namely, for green performance which has a significant impact on green manufacturing ability, organizational flexibility between green manufacturing and green performance play a coordinating role, which are shown in Figure 1.

2.2. Research Hypothesis on the Relationship between Green Manufacturing Capacity and Green Performance

2.2.1. The Relationship between Green Design Ability and Green Performance

Green design is also known as eco-design, environment-oriented design, environment-conscious design,

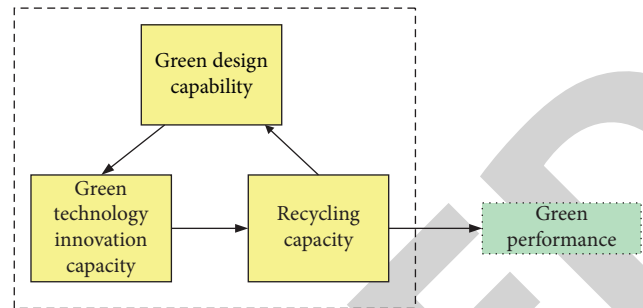


FIGURE 1: Mechanism model of green manufacturing capacity on green performance.

sequential design, and life-cycle design. Although there is no uniform definition of green design at home and abroad, the relationship between green design and green performance is studied from different perspectives. Green design is an important premise of green manufacturing. Its goal is to minimize environmental pollution and make full use of resources in the whole life cycle of products [19]. Green design ability can coordinate and optimize the economic and social benefits of manufacturing enterprises. Green design takes environmental attributes as the design goal and improves product economy while meeting the goal [20]. Green design is to eliminate the negative impact of all aspects of product life cycle, improve the efficiency of energy and resource utilization, achieve the most economical way to manufacture green products, through the use of various advanced technology and management methods, and ultimately improve brand image and economic benefits [21]. Based on the investigation of 107 executives in 86 enterprises in Taiwan, this paper analyzes the relationship between green design and green product marketing strategy and performance and concludes that the green design has a significant positive impact on the performance of green products. Consumers' consumption preferences are undergoing important changes, and consumers are more inclined to green products. Manufacturers will establish brand image and establish competitive advantages, so as to improve corporate performance [22]. Through green design, Walmart saves a lot of resources and energy, reduces carbon dioxide emissions by 60%, reduces environmental impact and operating costs, and improves environmental and economic performance. 148 manufacturing enterprises in Guangdong province were investigated, and a theoretical model of the relationship between dynamic factors of green supply chain and green design and performance was established. The results show that the green design has a significant positive correlation with green supply chain performance [23]. Most products in the design stage determine the manufacturing cost and use cost, and green design can save the cost and improve the economic benefits, that is, improve the economic benefits while meeting the requirements of environmental protection. Based on the above analysis, this paper believes that the stronger the green design ability is, the

better the green performance of the enterprise will be. Therefore, the hypothesis is put forward as follows.

H1: green design ability has a significant positive effect on green performance.

2.2.2. *The Relationship between Green Technology Innovation Ability and Green Performance*

Green technology innovation is also known as “low-carbon technology innovation,” “environmental technology innovation,” and “low-carbon technology innovation.” It is the ability to provide the business value to the enterprise and new products or services to customers and to minimize negative environmental impacts. Management innovation and technological innovation generated for the purpose of environmental protection belong to green technology innovation, namely, ecological technology innovation, and belong to technology innovation [24]. Green technology innovation capability is to save resources for enterprises, improve the utilization efficiency of resources and energy, and then create green performance for the government, enterprises, and public. By adopting technological innovation, developing countries can gain late-mover advantages, reduce production costs, and gain market opportunities and economic benefits [25]. Technological innovation ability is the ability acquired by enterprises through learning, development, and accumulation and the internal absorption, integration, and improvement of knowledge through micro- and macroenvironment, and then, the innovation ability is acquired and the enterprise performance is improved. Enterprises acquire technological innovation ability through knowledge accumulation and apply this ability to product development or process improvement, so as to improve production efficiency. Technological innovation ability has an important impact on the differentiated development of enterprises, and the diversity, advancement, and value of production process or products brought by this ability will directly affect the technical performance and enterprise development [26]. Enterprises should enhance their technological innovation ability, or they will fall into the extensive development mode of low efficiency and low added value, which will affect the improvement and development of enterprise performance. In conclusion, green technology innovation ability can help enterprises effectively get rid of the inertia and dependence generated by the original development model and improve the utilization efficiency of resources and energy, production efficiency, and performance quality through optimization innovation or breakthrough innovation. Therefore, this paper believes that green technology innovation ability has an important impact on green performance and proposes the following hypotheses.

H2: green technology innovation ability has a significant positive impact on green performance.

2.2.3. *The Relationship between Recycling Ability and Green Performance*

Recycling capacity is based on advanced technology and manufacturing level and the whole life cycle theory, through efficient, energy saving, and environmental protection to repair and transform a series of waste products and waste. With the rapid growth of economy, the production cost is higher and higher, and the improvement of economic efficiency is based on the continuous expansion of scale rather than the progress of technology. At the expense of external interests, he criticized this phenomenon. It is also proposed that an effective method should be established to prevent pollution and stop treatment [27]. Anderson proposed the 5R strategy to save resource cost and manufacturing cost through repair, reuse, recycling, and remanufacturing, improve production efficiency, meet the requirements of environmental supervision, reduce the total production cost, and improve industry performance [28]. From the perspective of import and export, the resource utilization is studied, and it is believed that recycling can reduce the consumption of nonrenewable resources, improve the international balance of payments, and reduce the multiplier effect and increase the income level, thus increasing the gross national product and employment rate and thereby improving social performance [29]. Chen thinks resource recycling is the core that develops circular economy. The model reflects the relationship between economic development and resource recycling and reveals that technological innovation and resource recycling are the key support for improving economic and social benefits. A review of domestic and foreign literatures shows that recycling capacity is the repeated use of resources, the reduction of resource consumption, the construction of ecological resource circulation, and the saving of resource cost, which is closely related to the improvement of social benefits. The stronger the recycling capacity is, the higher the resource utilization rate is and the more obvious the resource cost saving is. Therefore, the following hypotheses were proposed.

H3: recycling ability has a significant positive impact on green performance.

2.3. *Research Hypothesis on the Relationship between Various Dimensions of Green Manufacturing Capacity*

Based on the research and construction of the mechanism of action of green manufacturing ability on green performance, this paper further explores the relationship between various dimensions of green manufacturing ability and the degree of influence, so as to provide reference for the formation and cultivation of green manufacturing ability.

2.3.1. *The Relationship between Green Design Ability and Green Technology Innovation Ability*

For manufacturing enterprises, the green design is the carrier of transforming technology into green products and the driving force of technological innovation. Green design points the way for technological innovation through advanced ideas. If the results of technological innovation cannot be used for product improvement, it will not only produce no value but also consume resources. Green design ability is the ability to comprehensively consider the environment, quality, function, economy, and other factors of products, and green innovation ability is the ability to transform green design concept into green products. Research on new energy automobile industry shows that the green design can significantly improve innovation ability and analyze the connotation of innovation system from the perspective of design, development, and system [30]. The basic concept and research status of green technology innovation ability are summarized, internal and external factors are analyzed, and internal incentives such as R & D investment and green product design can improve green innovation ability [23]. On the basis of comprehensive analysis, this paper argues that green design capability is closely related to green technology innovation capability. The stronger the ability of green design, the more it can encourage enterprises to carry out green technology innovation, so as to accelerate technology research and development and transformation. Therefore, the following hypotheses were proposed.

H4: green design ability has a significant positive impact on green technology innovation ability.

2.3.2. *The Relationship between Recycling Ability and Green Design Ability*

The utilization capacity of the belt is the foundation of the sustainable development of resources and environment. The closed-loop model of utilizing resources to process products and transforming products into resources through recycling ensures the rational and sustainable utilization of resources and energy in the manufacturing process. The green design ensures the minimization of pollution and waste in the design stage, manufacturing stage, and consumption cycle stage. When enterprises recycle and process waste materials, data collection and reprocessing, as well as the difficulty of recycling, will form a large amount of data and information. They can provide this information by feeding reclaimed knowledge and experience data back into the design process. Further optimize and improve the green design process. Based on the whole life cycle theory, the vehicle green recycling system is studied. It is considered that the realization of green recycling ability has an important impact on green design ability [31]. Based on the above analysis, this paper believes that the accumulation of recycling capacity can provide positive feedback for the green design and provide reference for the selection of

materials and optimization of process design in the process of the green design, so as to improve the level of resource recycling and reduce the impact on the environment. Therefore, the following hypotheses are proposed.

H5: recycling ability has a significant positive impact on green design ability.

2.3.3. *The Relationship between Green Technology Innovation Ability and Recycling Ability*

Green technology innovation can improve the utilization efficiency of production resources, and products with green technology innovation can more easily change consumers' consumption concept and purchase behavior, so as to promote the recycling and utilization of products and production accessories. The green technologies proposed by the European high-level meeting are pollution control and recycling of finished products. The innovation capacity of green technology is mainly composed of three parts: the technological innovation capacity of producing clean products, the pollution control and prevention capacity in the manufacturing process, and the terminal disposal capacity of waste. To sum up, green technology innovation ability is the ability to balance the ecological environment and economic benefits. The aim is to prevent and reduce the environmental impact of resource consumption and waste in order to minimize pollution and maximize the recycling of products and crafts throughout the life cycle. For product recycling, technological innovation ability is one of the most critical supporting conditions. The stronger the innovation capacity of green technology is, the more consumable products and production accessories will be, so as to realize the green recycling of wastes. Based on the above analysis, this paper believes that green technology innovation ability is the key to terminal management and transformation, which can provide support for recycling, so as to improve recycling efficiency. Therefore, the following hypotheses were proposed.

H6: green technology innovation ability has a significant positive impact on recycling ability.

2.4. *Brief Description and Application of Artificial Intelligence and Blockchain Technology.* The main feature of blockchain technology is decentralization, and it is the best encryption method to protect data information. Its specific features are decentralized structure, data and information which cannot be tampered with, distributed accounting and storage methods which are adopted, and cryptographic anonymity protection.

The emergence of artificial intelligence is the result of the evolution of tools. It responds to the requirements of the development of productivity and satisfies the needs of mankind to transform the objective world. The definition of artificial intelligence does not have a definite expression, but

the essence of artificial intelligence is a new tool for human practice, and it reflects human abilities and will.

The development of artificial intelligence and blockchain technology has brought huge changes to the manufacturing industry. Artificial intelligence can help people carry out some highly repetitive and simple production processes. Blockchain technology can bring new technologies to green manufacturing. This technology provides technical support for the sustainable development of society.

3. Experiments

3.1. Research Methods. The research methods of this paper are as follows:

- (1) Literature and theoretical research: this paper, by referring to relevant theoretical studies and literature results on green manufacturing capability theory and dynamic capability, put forward the research perspective of this paper and explored the mechanism of green manufacturing capability by integrating management, statistics, metrology, and other relevant disciplines.
- (2) Empirical study: on the basis of literature and related research, this paper puts forward the research hypothesis and builds the research model. The research data were obtained through questionnaires, and hypotheses were verified by correlation, regression, and structural model. The relationship among green manufacturing capability, organizational flexibility, and green performance, as well as the improvement of green manufacturing capability, was analyzed and studied.

3.2. Design of Questionnaire. The microlevel data required in this paper cannot be obtained from the annual report or database, so a questionnaire survey is needed. Through the field survey of enterprise management personnel, by drawing on the experience and suggestions of enterprise development, the measurement items were modified and supplemented. Finally, by sorting out the questions, the questions with ambiguous sentences, which are difficult to understand and have unreasonable logic, were deleted to form the final questionnaire. Likert5 scale was adopted for all measurement items in the questionnaire, and 1–5 selection was used to indicate the degree of conformity with the actual situation of the enterprise.

According to the principle of questionnaire design, there are no more than 10 measurement items for each variable in this paper, a total of 45 items. The content includes three parts. The first part is the enterprise basic situation investigation. The second part is the investigation of green manufacturing capability and organizational flexibility. There are three dimensions of green manufacturing capability with 21 items, and two dimensions of organizational flexibility with 7 items. The third part is a survey of related issues of enterprise green performance, with two dimensions and the number of items is 7.

3.2.1. Sample Selection. Due to the large number of manufacturing enterprises, limited by resource conditions, it is impossible to exhaust all the manufacturing enterprises. Therefore, the selection criteria of this paper are as follows. First of all, the selected manufacturing enterprises must have the awareness of green manufacturing and have practical research significance. Secondly, the green performance of market competition can reflect the unique role of manufacturing enterprises in green innovation ability. Similarly, the availability of data can be achieved with limited resource constraints. Based on this, samples of this paper are selected as follows: food industry, paper industry, home appliance industry, automobile industry, home building materials, and energy mining. The samples were mainly concentrated in Shandong, Liaoning, and Heilongjiang provinces. The major cities are Jinan, Qingdao, Yantai, Dalian, Shenyang, Anshan, Harbin, Daqing, and Qiqihar. Enterprise selection is mainly based on the industrial and commercial enterprise directory, industry yearbook, and provincial and municipal enterprise yearbook.

3.2.2. Selection of Research Objects. Research, mainly by questionnaire star platform, e-mail three forms, and field investigation, in order to avoid information distortion phenomenon appear in the research, based on the description of the related problems in the design of the questionnaire, was analyzed and modified, to ensure that the respondents can be fully understood; on the contrary, for the choice of research object, as far as possible, the enterprise high-level leadership, technical director, and director of operations are taken as the research object, in order to ensure the quality of the questionnaire recovery and its reliability and validity.

4. Discussion

4.1. Sample Data Analysis of the Effect of Green Manufacturing Capacity on Green Performance

4.1.1. Descriptive Statistical Analysis of the Effect of Green Manufacturing Capacity on Green Performance. Through descriptive statistical analysis of data, indicators such as mean value and standard difference are used to reflect the distribution and dispersion of variables. The sample mean also becomes the sample mean which reflects the average level or concentration of data. The specific results are shown in Figure 2. Standard deviation reflects the degree of dispersion of data. The larger the value, the higher the degree of dispersion, and the greater the difference, the less representative the data. The specific results are shown in Figure 3.

As can be seen from Figure 2, the average value of green manufacturing capability measured by each project is between 3.18 and 3.97, indicating that the green manufacturing capability of enterprises is relatively high. Among them, the innovation ability of green technology is relatively high, which indicates that most enterprises have noticed the improvement of the innovation ability of green technology, followed by the green design ability. In other words,

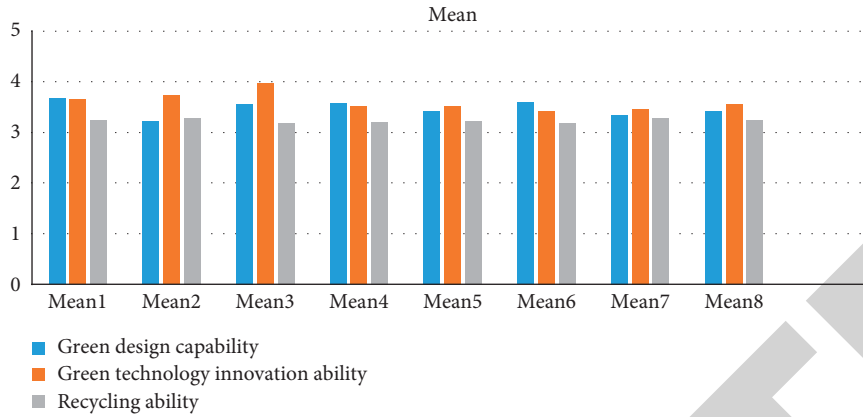


FIGURE 2: Descriptive statistical analysis of green manufacturing capability indicators: mean.

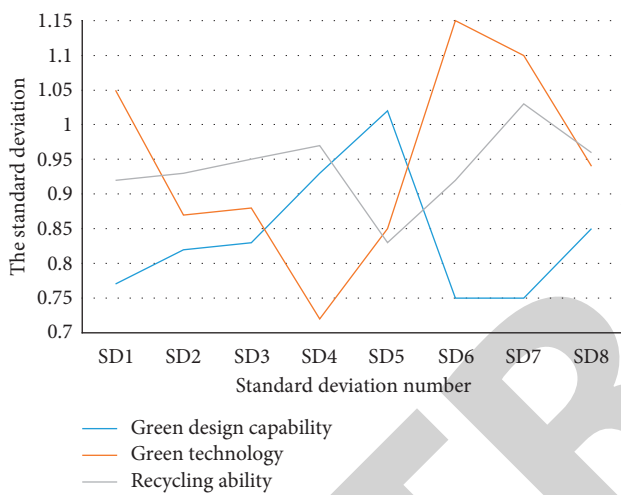


FIGURE 3: Descriptive statistical analysis of green manufacturing capability indicators: the standard deviation.

enterprises have realized that the early design of green products can effectively reduce the generation of pollution and the efficiency of production process. The low average recycling capacity indicates that the current recycling capacity of the enterprise needs to be improved, and the support system of garbage recycling is not perfect. In addition, as can be seen from Figure 3, the standard deviation of the measurement items is relatively close and the data is relatively representative.

4.1.2. Correlation Analysis of the Effect of Green Manufacturing Capacity on Green Performance. Correlation analysis is widely used in statistics, mainly reflecting the degree of closeness between variables. The degree of one variable changes when another variable changes. Generally, when the absolute value of correlation coefficient is higher than 0.8, it indicates a strong tightness between variables. When the absolute value of correlation coefficient is lower than 0.3, it is considered that the interdependence between variables is weak. The correlation analysis results are shown in Table 1. The three components of green manufacturing capability are significantly positively

correlated with green performance. There is also a high correlation between green performance. There is correlation between green performance. There is correlation between green design ability and green technology innovation ability, green technology innovation ability and recycling ability, and green technology and recycling ability. The interaction item between green design ability and organizational flexibility is positively correlated with green performance, while the interaction item between green technology innovation ability and organizational flexibility is positively correlated with green performance. Only the interaction item between recycling ability and organizational flexibility is not highly correlated with green performance.

4.2. Structural Equation Model Test and Analysis of the Effect of Green Manufacturing Capacity on Green Performance

4.2.1. Set the Initial Model. According to the action mechanism model of green manufacturing capacity constructed in this paper, the initial structural equation model of this paper is shown in Figure 4. Among them, green design ability, green technology innovation ability, and recycling ability are exogenous latent variables, while green performance is endogenous latent variables.

4.2.2. Evaluation of Model Fitting Degree. By running the initial model of the structural equation of green manufacturing capacity, the fitting results of each adaptation index are shown in Table 2.

As can be seen from the above table, the fitting effect of the set initial model is relatively ideal, and the degree of freedom of chi-square value is 1.809, lower than 3. RSEMA value was 0.025, lower than 0.05. The relative fit index of GFI, NFI, and CFI baseline is higher than 0.9. Both PNFI and PGFI were higher than 0.5. The value of value-added fit index IFI was 0.895; although lower than the critical requirement of 0.9, the overall effect of model fitting did not affect the fitting of model and sample data, so it was considered that the structural model passed the fitting degree test. After the model passes the fitting degree test, it continues to analyze the path coefficient, as shown in Table 3. In

TABLE 1: Variable correlation analysis.

Measuring variable	1	2	3	4	5
Green design capability	1	—	—	—	—
Green technology innovation capacity	0.712**	1	—	—	—
Recycling capacity	0.705**	0.731**	1	—	—
Organizational flexibility	0.485**	0.471**	0.375**	1	—
Green performance	0.742**	0.786**	0.665*	0.586**	1

Note: ** represents significant level $P < 0.01$; * represents significant level $P < 0.05$.

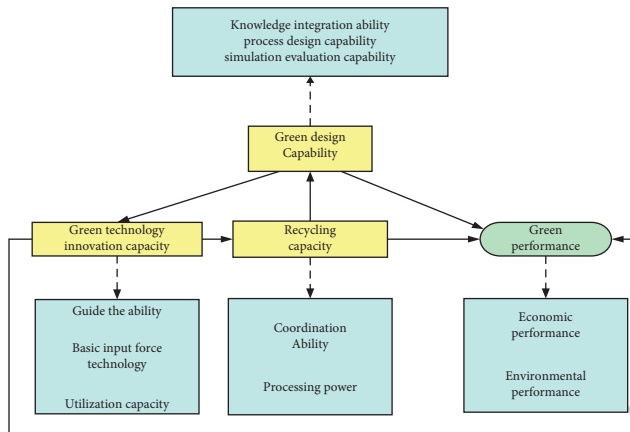


FIGURE 4: Mechanism model of green manufacturing capacity on green performance.

TABLE 2: Test results of the model fitness index.

X^2/df	RSEMA	GFI	IFI	NFI	CFI	PNFI	PGFI
1.809	0.025	0.934	0.895	0.906	0.902	0.544	0.541

order to see the data of each part more intuitively, the path analysis and comparison are shown in Figure 5.

Through Table 3 and Figure 5, you can see that the green design, green technology innovation ability, and function of the recycling capacity and performance of the green path coefficients were 0.525, 0.544, and 0.447 and P values were 0.004, 0.006, and 0.008, by significance test, which show that green design, green technology innovation ability, and recycle ability have significantly positive effect on green performance, support hypotheses were H1, H2, and H3. Green design capability to green technology innovation ability, ability of green design, and green technology innovation ability as the ability to recycle the recycle ability of path coefficients were 0.533, 0.538, and 0.602 and P values were less than 0.01, by significance test, which show that green design capability to green technology innovation ability, ability of green design, and green technology innovation ability as the ability to recycle to recycle ability have significant positive effect, and this paper assumes that the H4, H5, and H6 were verified.

4.3. Analysis of the Effect of Green Manufacturing Capacity on Green Performance. In this paper, empirical research is used to analyze the above hypotheses and the relationship between green manufacturing capacity and green

performance, the functional relationship between green manufacturing capacity and green performance, and the regulatory effect between green manufacturing capacity and green performance. According to the results of empirical analysis, the following table is a review of the test results of the proposed hypothesis, as shown in Table 4.

4.3.1. The Relationship between Green Manufacturing Capacity and Green Performance. Through the above empirical analysis, green manufacturing capability of three dimensions green design, green technology innovation ability, and ability of recycling, and the significant positive role which the green performance through the correlation coefficient test, significance test, and the path test further verify the original hypothesis, namely, green manufacturing capability, have a significant positive influence on the green performance. Therefore, for manufacturing enterprises, they should attach importance to the training and development of green manufacturing ability, comply with the macro-environment of sustainable development, integrate internal and external resources of the enterprise, and rely on the coordinated development of three capability dimensions to realize green manufacturing and improve the green performance of the enterprise.

4.3.2. Green Manufacturing Capacity Constitutes the Interaction between Dimensions. Through empirical analysis, the research hypotheses H5 and H6 have been verified, indicating that the three components of green manufacturing capability affect and restrict each other. The green design is the initial activity to form green manufacturing capacity. It is the premise for the manufacturing industry to meet the requirements of environmental development, meet the demand for green products, improve the utilization rate of resources, and reduce pollution. The innovation ability of green technology is an important support link to improve the green manufacturing ability. Through the accumulation of knowledge and technology, the practical transformation ability of the green design can be realized. Recycle ability is not only the product life cycle-based closed-loop mode, through the waste recycling and utilization of resources, reducing the resource usage, and getting rid of manufacturing high consumption situation of the development of raw materials, but also effective to protect and save the productive resources and improve the ability of green manufacturing, an important way of promoting the development of circular economy. At the same time, the

TABLE 3: Path estimation and test values.

The relationship between variables	Path coefficient	C.R.	P
Green design ability→green performance (1)	0.525	2.963	0.004
Green technology innovation ability→ green performance (2)	0.544	2.745	0.006
Recycling capacity→green performance (3)	0.447	2.158	0.008
Green design ability→green technology innovation ability (4)	0.533	3.367	0.003
Green design ability→recycling ability (5)	3.304	3.304	0.001
Green technology innovation ability→recycling ability (6)	0.602	3.551	0.001

Note: the graphic name label is the data sequence number in Table 3.

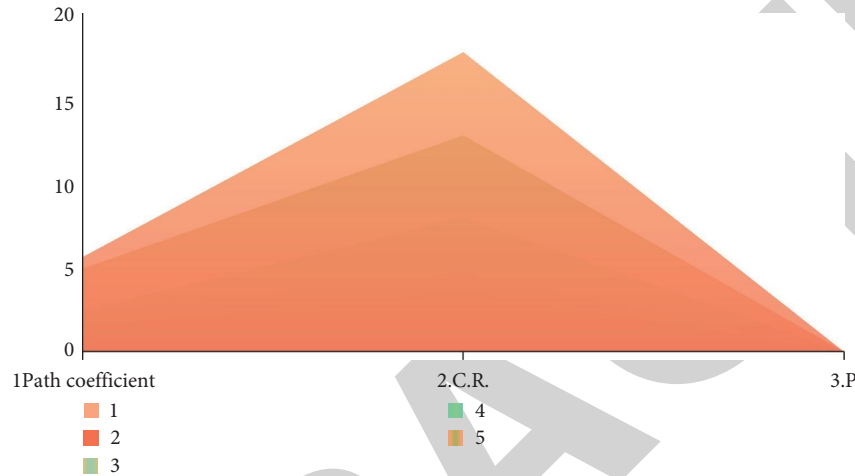


FIGURE 5: Path estimation and test values.

TABLE 4: Research hypothesis verification results.

Sequence	Assuming the content	Results
H1	There is a significant positive correlation between green design ability and green performance	Support
H2	There is a significant positive correlation between green technology innovation ability and green performance	Support
H3	Recycling ability is positively correlated with green performance	Support
H4	Organizational flexibility is positively correlated with green performance	Support
H5	Green design ability has a significant positive effect on green technology innovation ability	Support
H6	Recycling ability has a significant positive effect on green design ability	Support

improvement of green design ability can play a positive feedback and guidance role in the direction of technological innovation and technological extension and diffusion, so as to continuously innovate key processes, improve recycling efficiency, and help enterprises gain resource advantages. The comprehensive empirical analysis has been clear about the inherent role performance path of green manufacturing capacity for green design, green technology innovation ability, and circulation ability, when the loop processing power accumulated to a certain extent and positive impact on the green design ability, thus forming a closed loop, through interaction and mutual influence between the three, and promote green manufacturing capacity.

4.3.3. The Regulating Effect of Tissue Flexibility

Research Hypothesis H4. By verifying that flexible organizational structure and distributed management can help enterprises to more flexible and efficient rapid response,

according to internal and external environment changes of reasonable selection and allocation of resources, the organization system of efficient allocation of manpower, financial, and material resources give full consideration to the product green factors, both flexibility and stability in green manufacturing, to provide institutional guarantee for the enterprise. Research Hypotheses H8. Through confirmatory test, the organizational flexibility will affect the enterprise for green products and the design of the direction, so companies through flexible distributed management and processing capabilities can help enterprises to quickly get green product market demand information to help the designer to seize the opportunity and to meet the requirements of green manufacturing, green products in the future market share, and the enterprise image.

Through the above analysis, to cultivate green manufacturing capabilities and improve green performance, flexible management and manufacturing processes need to be linked, and the structure and scale of elements must be dynamically adjusted to ensure the matching and

collaboration between green manufacturing. Companies rely on the role of green manufacturing capabilities and growth rules to improve their green performance and obtain sustainable competitive advantages and corporate brand image.

5. Conclusions

This article is mainly about the research on the sustainable development performance of green manufacturing technology innovation based on artificial intelligence and blockchain technology. Through combining the relevant theories and literature at home and abroad, the authors have deeply studied the development and application of artificial intelligence and blockchain technology, analyzed the connotation, characteristics, dimensions, and mechanism of green manufacturing capabilities, and have mainly drawn the following conclusions: with the aid of technology, the connotation characteristics and dimensional composition of green manufacturing capabilities are analyzed from a dynamic perspective. Through combining the related literature of green manufacturing capability and in-depth analysis of the connotation characteristics of green manufacturing capability, three subcapabilities of green design capability, green technology innovation capability, and recycling capability are obtained. These three capabilities restrict and influence each other and jointly promote the formation and improvement of green manufacturing capabilities. The abstract green manufacturing capability is transformed into a dynamic manifestation of design, innovation, and recycling, which improves the operability and observability, and provides a supplement for the further expansion and improvement of the corporate green manufacturing capability analysis framework. The development of artificial intelligence and blockchain technology will change the development model of traditional manufacturing and promote the green and sustainable development of manufacturing.

The main model of green manufacturing capabilities and green performance based on artificial intelligence and blockchain has been established. The empirical analysis shows that green manufacturing capability has a positive impact on green performance, that is, green design capability, green technology innovation capability, and recycling capability, and all have a significant positive impact on green performance. In addition, the three components of green manufacturing capacity interact and restrict each other and have a significant impact. This has a positive regulating function for regulating the organizational flexibility between green design and green performance and a positive regulating function between green technological innovation ability and green performance. There is no relationship between the recycling capacity of the company and the green performance. Artificial intelligence and blockchain technology provide innovative industrial methods for green manufacturing and have made substantial contributions.

This paper studies the sustainable development performance of green manufacturing technology innovation based on artificial intelligence and blockchain technology and realizes the sustainable development of manufacturing

through artificial intelligence and blockchain technology innovation. As a strategy to prevent products from negatively affecting ecological resources, the green design is the basis for implementing green manufacturing. The key to green manufacturing is the green design. The sustainable development model of green manufacturing is the future development trend and direction of the manufacturing industry and is the only and effective way to achieve the sustainable development of the manufacturing industry. At the same time, the application of high-tech will lead the development of the manufacturing industry, improve the sustainable development level of the entire manufacturing industry, strive to maintain the leading level and competitive advantage in the future competition, and realize the sustainable development of the manufacturing industry.

Data Availability

No data were used to support this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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