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Ecological and Economic Marketing from the Perspective of Integrating the Internet of Things with Natural Protection and Environment

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Abstract: Enterprises are the main body of implementing ecological marketing, and they are also the most direct beneficiaries of ecological marketing. Ecological marketing reflects the development characteristics of the era of knowledge economy and is the only way for enterprises to develop. In order to solve the shortcomings of the existing ecological and economic marketing research from the perspective of natural protection and environment, this paper discusses the characteristics of ecological economic marketing, the operation mode of the Internet of Things platform and the ecological marketing revenue function, and investigates and discusses the environmental configuration and simulation parameters and the entropy weight of each index for the evaluation of enterprise ecological marketing effect. The ecological and economic marketing supply chain scheme is designed from the perspective of nature protection and environment with the integration of the Internet of Things. Through the performance optimization experiment, the experimental data shows that the IoT single chain throughput of single chain, double chain and IoT single chain respectively reaches 82, 100 and 100 in the running time of 250s. Therefore, it verifies the feasibility of the ecological and economic marketing plan under the perspective of nature protection environment integrating the Internet of Things.

1. Introduction

With the development of blockchain, artificial intelligence, edge computing and other new technologies, the sharing, real-time, openness and other characteristics of new Internet technologies

also provide opportunities for economic marketers to develop, which plays an important role in promoting the development of ecological and economic marketing from the perspective of industrial natural protection environment.

Nowadays, more and more scholars have conducted a lot of research on ecological and economic marketing from the perspective of natural protection environment through various technologies and system tools, and have also made certain research achievements through practical research. Mabrouki J adopts practical product promotion and business promotion methods according to the marketing concept and product quality. The Internet of Things (IoT) refers to a complex network technology structure that combines the monitoring and linking processes in different information sensing devices. Through the analysis of market ecology and economic theory, economic marketing technology and Internet of Things technology, this paper expounds the marketing strategy in the age of big data, and conducts a simple study on it [1]. The main goal of Ammar M is to identify pollutants in the atmosphere with the help of the Internet of Things (IoT). The IoT based system will check the air quality to determine if it exceeds a certain limit. MQ135 gas sensor is effectively used for air quality analysis to detect most harmful gases in the atmosphere. This IoT based mechanism helps to continuously monitor harmful pollution levels in web pages that can be viewed from anywhere. Air quality measured and monitored using the Internet of Things overcomes the shortcomings of existing mechanisms by using continuous graphical changes in mobile applications [2]. Lunardini F aims to propose an integrated neutrino framework based on the Internet of Things (INF IoT) at all stages of the sales, purchase and marketing process to support marketing personnel and companies to develop strong marketing strategies using the identification data of IoT devices. The experimental results show that this method has high performance and efficiency. Originality value can reduce business activities to its core components. In the simplest case, these core components include value proposals, distribution channels and customers, and explain how the multi participant network generates products and services and distributes [3]. Although the existing research on ecological and economic marketing from the perspective of natural protection and environment is very rich, there are still some limitations in its practical application.

Based on the analysis of the characteristics of ecological economic marketing, the operation mode of the Internet of Things platform and the ecological marketing revenue function, this paper focuses on the ecological and economic marketing issues from the perspective of the natural protection environment of the Internet of Things, and combines the concept of sustainable development to build an evaluation system to provide reference for the sustainable development of ecological and economic marketing. Aiming at the marketing business solution under the vertical ecology, combining the technical characteristics of the Internet of Things and blockchain, build an ecological enterprise economic marketing supply chain solution. Provide support for the improvement of the competitive advantage of enterprise ecology and economic marketing in emerging markets and the implementation of projects.

2. Research on Ecological and Economic Marketing Design from the Perspective of Nature Protection Environment Integrating the Internet of Things

2.1. Ecological Economic Marketing Characteristics

(1) Consumability: The premise of ecological marketing is consumers' green consumption awareness. Consumers will pursue the quality of life after their material needs are met. The demand of consumers for a healthy, safe and clean environment has led to the rise and development of green product production and green industry [4].

(2) Non discrimination: ecological standards and signs show non discrimination in the world. It is required that product research and development, product production, product sales and other

aspects should meet the requirements of environmental protection, without damaging the ecological environment, saving resources, and harming human health [5].

(3) Mutual benefit: Ecological marketing focuses on the mutual benefit of all links involved in the entire product life cycle, rather than short-term benefits [6]. The ecological marketing model can maintain long-term advantages and benefit customers and society for a long time [7].

2.2. Operation Mode of Internet of Things platform

(1) Local Area Connection: Because of the huge cost of operators' access, in many occasions where free protocols are used, free short distance access protocols are usually used and basic technology interconnection is carried out [8].

(2) Due to the portability of terminal equipment and the high timeliness of data, the IoT system can track behavior objects in real time [9].

(3) Environment awareness: by setting up terminal products in the object, the IoT platform can collect detailed data that is most timely and close to the target. The device has network connection function [10].

(4) Data processing: First of all, big data technology is widely used. Using the Internet of Things can directly provide users with software technology services, such as research and development of smart products, research and development of application software and solutions. In addition, using the Internet of Things can manage and analyze a large amount of customer information collected through terminals within the enterprise, and submit it to users who need it [11].

(5) Information trading platform: sound supply chain management provides small enterprises with early model opening and mass production, and warehouse management and logistics distribution in the middle period [12].

2.3. Ecological Marketing Revenue Function

(1) Ecological level of enterprise marketing

This paper introduces green level to express the impact of green marketing behavior on ecological marketing [13]. Let $k(r)$ represent the ecological level of enterprise marketing [14]. Ecological marketing can improve the ecological level of enterprise marketing. The ecological level of enterprise marketing can be expressed as:

$$k(r) = -\alpha k(r) + \mu w(r), k(0) = k_0 \tag{1}$$

Among them, $\mu > 0$ represents the efficiency of ecological marketing, reflecting the growth rate of the ecological level of enterprise marketing with the input of ecological innovation knowledge, $\alpha > 0$ represents the decline rate of the ecological level over time, and $k_0 > 0$ represents the ecological level of enterprise marketing in the initial state [15].

(2) Ecological marketing knowledge base of enterprises

Enterprise y's knowledge level in the process of collaborative ecological marketing can be expressed as:

$$g_y(r) = g_y(r-1) + \left[w_y + \overline{T}_y\right] \tag{2}$$

Among them, for enterprise y participating in the cooperation, the enterprise's knowledge level $g_y(r)$ in the marketing cooperation process includes the enterprise's initial knowledge level $g_y(r-1)$, the enterprise's knowledge investment w_y in this innovation cooperation and the

enterprise's learning achievements $\bar{T}_y$ generated by knowledge sharing in the marketing cooperation process.

(3) Trust level and knowledge complementarity among enterprises

This paper introduces the knowledge complementarity $\delta = \mathrm{cov}(r_y r_{y'})$, that is, the coefficient between enterprise y knowledge base and enterprise y' knowledge base. The matrix refers to the total knowledge base. $g_y r_{y'y}$ represents the amount of knowledge that enterprise y' can share with enterprise y, where $g_y q_{y,y}(1-\delta)$ represents the knowledge that enterprise y' and enterprise y are not similar [16]. The learning process of enterprise y occurs in the case of $g_y q_{y,y}(1-\delta) - g_y > 0$. The amount of knowledge that enterprise y learns through cooperation with enterprise y' can be expressed as:

$$\bar{T}_y \partial \eta_y \left[\left[g_y - g_y q_{y'y}(1-\delta) \right]^+ + \delta g_y q_{y'y} \right] \tag{3}$$

3. Research on Ecological and Economic Marketing from the Perspective of Nature Protection Environment Integrated with the Internet of Things

3.1. Environment Configuration and Simulation Parameters

In different application scenarios, OMNeT++is used for the communication process of IoT devices from transaction generation to final confirmation, encapsulation to block in the actual environment [17]. Record transaction throughput and cost in different scenarios. Finally, the recorded data is visually analyzed through Matplotlib library. Some parameters are recorded in Table 1.

Table 1. Blockchain simulation parameter settings

Environment configuration	System	Windows 11
	Memory	16GB
Parameter	Cost	Storage
	Delay	Delay in confirmation of transactions
	Utilization	Ratio of the number of transactions to the maximum number of transactions
	Ratio	Transaction generation rate
	Running time	Running time of consensus algorithm
	Timer	Maximum time difference of two consensus algorithms

3.2. Entropy Weight of Each Index for Enterprise Ecological Marketing Effect Evaluation

Determine the weight of each evaluation index matter-element This paper uses the entropy

weight method to determine the index weight from the aspect of extending the product and marketing channel ecology [18]. To make the evaluation results more realistic, the entropy weight of each evaluation index can be obtained by combining the fuzzy composite matter-element of each evaluation index, as shown in Table 2.

Table 2. Entropy weight of each index of enterprise ecological marketing effect evaluation

Evaluation factors	Evaluating indicator	Entropy	Entropy weight
Extend the ecology of products and marketing channels	Ecological packaging	0.97	0.16
	Ecological transportation	0.97	0.16
	Ecological storage	0.97	0.20
	Ecological loading and unloading	0.97	0.16
	Supplier's ecological degree	0.97	0.16
	Ecological degree of distributors (retailers)	0.97	0.16

4. Research on the Application of Ecological and Economic Marketing from the Perspective of Nature Protection Environment Integrating the Internet of Things

4.1. Construction of Ecological and Economic Marketing Supply Chain Scheme from the Perspective of Nature Protection and Environment Integrated with the Internet of Things

(1) Supply Chain Data Management and Optimization

1) Supply chain data management: the main participants in the enterprise supply chain include product manufacturers, processing companies, distributors and retailers. The data created internally by each participant can generally be divided into three main information flows: information about products, information about suppliers and customers. Figure 1 describes a possible interaction between the main participants in the supply chain of an enterprise.

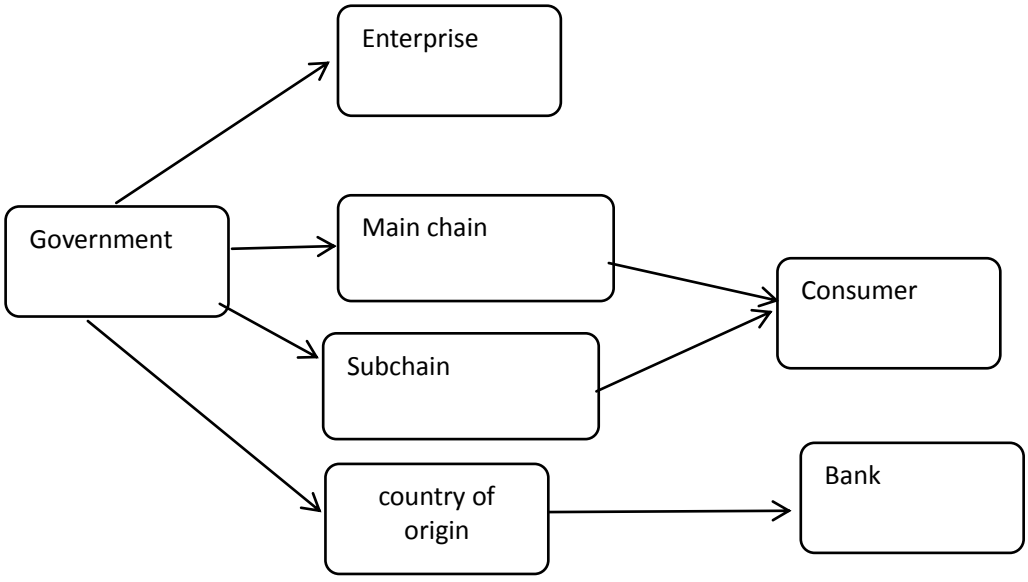

Figure 1. Participants in the sustainable supply chain

2) Supply chain data value creation: With regard to ecological and economic marketing from the perspective of natural protection and environment, the expectation of each participant's role type, access or exit mode, information form and ownership should be clearly defined.

3) Data planning: By managing such templates, participants can understand why collecting data first and where to store data will be the best decision for ecological and economic marketing management.

(2) Double chain structure based on blockchain

This paper constructs a blockchain dual chain structure composed of main chain and sub chain.

1) Main chain design: the main chain stores the information of various transactions in the enterprise supply chain and is supervised by the government regulatory authority. The main chain designs and manages block data structures, smart contracts and trading mechanisms. The task of key nodes is to audit the data submitted by non key nodes.

2) Sub chain: The sub chain can collect information from multiple companies and product producers, including a large amount of information and a variety of information types. Therefore, the data reduction algorithm of the edge node is designed to compress the massive data, and then the smart contract is used to audit and verify the data.

4.2. Application of Ecological and Economic Marketing Schemes from the Perspective of Natural Protection Environment Integrating the Internet of Things

The evaluation system needs to consider both performance and cost under the perspective of natural protection and environment. The evaluation of these indicators will help to achieve the lowest cost of sustainable development of economic marketing under the given performance requirements. Table 3 compares the performance and delay of different chains in the context of eco enterprise economic marketing supply chain.

Table 3. Throughput data of different chains

Running time	Enterprise double chain	Enterprise single chain	IoT single chain
50	99	12	20
100	100	16	50
150	100	40	98
200	100	78	99
250	100	82	100

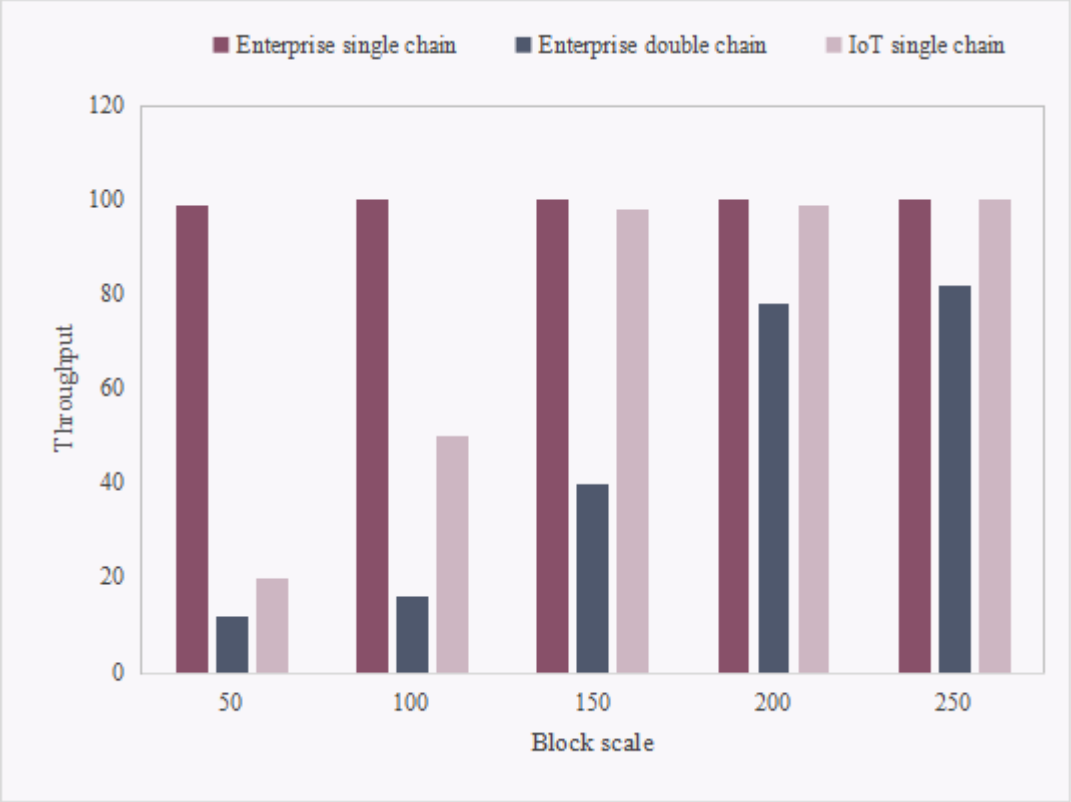

Figure 2. Throughput comparison of different chains

In Figure 2, the running time of the algorithm proposed in this paper is longer. The sub chain in the dual chain has a large delay, which will lead to congestion at the initial stage of operation, thus affecting the efficiency. However, two aspects of the dual chain are adapted to the post congestion situation, and the throughput of the dual chain is gradually improved. For performance optimization, the double chain implementation cost in the ecological enterprise marketing supply chain scenario is the lowest. In the ecological enterprise marketing supply chain scheme, the cost of double chain is the lowest, so that it can ensure the overall optimal performance and efficiency.

5. Conclusion

This paper proposes the combination of blockchain and Internet of Things technology for ecological and economic marketing solutions from the perspective of natural protection environment. Aiming at the challenges faced by transparency, data collection and data sharing in ecological marketing, it constructs a management framework based on ecological enterprise supply chain. Then, it designs a sustainable enterprise marketing blockchain based on dual chain structure to achieve sustainable management of the entire supply chain, Promote the value creation of product life cycle. Finally, the simulation results show that the blockchain based on dual chain structure can minimize the cost while maintaining performance in the context of sustainable enterprise ecology and economic marketing supply chain compared with the blockchain based on single chain structure.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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