Research on the Influence of Fresh E-commerce Application Logistics Information System Based on Vensim

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Abstract

Since 2012, a large number of enterprises have entered the field of fresh e-commerce, and they are competing for profits in the last undeveloped area in the e-commerce field. Due to the advancement of logistics information technology and a good competitive environment, China's fresh e-commerce has ushered in the vitality of development. However, the logistics and supply chain of fresh e-commerce is more complicated than the conventional e-commerce, so the development of fresh e-commerce has encountered many problems. The application of logistics information system can effectively alleviate or even solve the problems in the fresh supply chain. This paper uses the theory and knowledge of system dynamics, combined with Vensim software to simulate the fresh supply chain to establish a fresh supply chain ecosystem model, through the simulation results. To study the impact of the degree of logistics system development on the profitability of fresh e-commerce companies and develop relevant development strategies.

Keywords

Fresh e-commerce, logistics information system, vensim.

1. Introduction

Since the introduction of e-commerce in China, there have been two e-commerce models. The first generation of e-commerce models mainly include B2B, C2C, and B2C. Since the products in this mode can only be observed and selected by consumers' information on online products, they can experience the functions of their products after receiving the goods, and quality, which leads to extremely high exchange rate and return rate, and the seller's goods are mixed in this mode, which will often reduce the buyer's consumption experience. So in this mode of many defects, the second generation of e-commerce mode that called O2O mode came into being. The 020 model is a new e-commerce model that is more conducive to enhancing the consumer experience. It combines offline business opportunities with the Internet, making the Internet a front-end for offline transactions, and bringing online consumers to reality store to go.

The e-commerce model has gradually grown and developed, and various professional e-commerce platforms have emerged one after another. However, the first developed products are often those that are easy to store and distribute. The fresh products are much more difficult in the storage environment, transportation links, and distribution environment than conventional goods, which leads to the lag of fresh e-commerce compared to conventional daily necessities such as clothing. In the case that other categories can be profitable, the e-commerce of fresh goods has a lot of profits to be tapped. E-commerce has developed to the present day, both in terms of quality and speed of distribution, and has made a qualitative leap. E-commerce related technologies are also rapidly developing in fierce competition. These technological advances have revolutionized information flow and capital flow, enabling e-commerce has great advantages. On this basis, the fresh e-commerce business that has been

in waiting period has also begun to develop, and many difficulties have been encountered in the development process, which has caused many enterprises to stop at this "big cake". This paper uses Vensim software to establish a system dynamics model to study the impact of the degree of application of logistics information system on fresh e-commerce, and then analyze and formulate the countermeasures for fresh e-commerce to solve problems based on simulation results.

2. Overview of Fresh E-commerce and Logistics Information System

2.1 Fresh E-Commerce Concept

E-commerce of fresh products is a process of combining e-commerce and selling fresh products on the Internet. The products sold are generally fresh fruits, vegetables, fresh meat, etc. so from the procurement of products, the processing of fresh products, storage and distribution processes are much higher than the requirements of conventional logistics [3]. In 2012, it was regarded as the first year of the development of fresh e-commerce. Many companies entered this field at the same time, which promoted the development of China's fresh e-commerce.

2.2 The Development Status of Fresh E-Commerce

With the continuous deepening of the "Internet + Agriculture" trend, fresh e-commerce has maintained a rapid development trend and is increasingly becoming a breakthrough growth point for the e-commerce industry. The huge market prospects have attracted many fresh e-commerce companies to enter the market: Jingdong's 70 million US dollars led the Tiantian Orchard; Alibaba invested in Yiguo; SF cross-border opened SF's preferred; Suning Supermarket launched "Su Xiansheng"; Amazon announced the preparations Long-lived freshmen, including 21cake, Dole China, Zhangzidao, etc. Lenovo Jiawo launched Jinyanguo kiwifruit, "Reach" and "Orange" and "Pan Apple" together to set off a wave of fruit network marketing

However, the development of new things cannot be smooth sailing, and fresh e-commerce has encountered many difficulties in the development process. Fresh e-commerce has a problem of difficult profitability. As of July 2015, only 40 domestic fresh e-commerce companies have achieved profitability, and 95% of fresh e-commerce companies are still at different levels of losses, including Jingdong, Tmall, SF and other fresh e-commerce giants. Large-scale integrated e-commerce companies have strong financial support, and short-term losses can still be maintained, but many small and medium-sized fresh e-commerce companies have been forced to withdraw from the market due to the break of the capital chain.The failure of once-famous vertical e-commerce companies such as yucca, me qi and butlers shows the grim situation faced by the birth of fresh e-commerce. Although the fresh e-commerce has a tortuous road, its development prospects are still optimistic in the industry. The favor of capital has injected new vitality into the development of fresh e-commerce. Under the background of the “cold winter” of capital in 2015, COFCO bought the network and completed the C round of 220 million US dollars of financing, setting a new high in the industry. The original life, daily orchard, multi-point and other companies have also completed a new round of financing. In 2016, Box Ma, founded by HouYi, opened the door to the new retail model, and then entered the development of “running”, becoming the most popular online supermarket.

The transformation of traditional agricultural market into e-commerce has became a new growth point for the development of fresh e-commerce. Faced with the impact of the rapid development of fresh e-commerce on the traditional fresh industry, many agricultural marketes are actively transforming, leveraging the Internet informationization trend to carry out electronic trading of agricultural products, electronic auctions and futures trading. For example, Shouguang Agricultural Products Logistics Park has established a vegetable electronic auction center with a daily trading volume of more than 1 million kilograms. It has successfully implemented the order farming model of “not receiving first sale, not planting first sale” [4].

2.3 The Meaning of Logistics Information System

Logistics information system is to meet the needs of the logistics operation, management and decision-making, using computer hardware, software, network communications and other equipment.logistics information collection, transportation, processing, storage, update and maintenance, to support the logistics management, operating personnel and customer logistics management and operation, coordination and control the normal running operation subsystem of information system.It is a modern database technology and logistics business closely combined management information system [5].

2.4 The Impact of Applying Logistics Information Systems in the Fresh Supply Chain

In the fresh supply chain, there are often many intermediate links, low transportation efficiency, high terminal prices and serious product damage. Applying logistics information systems and related support technologies to the fresh supply chain can improve the science of the entire supply chain. Management ability, smooth access to fresh market information channels and distribution channels, so that the production, supply and marketing systems of the fresh produce industry are more closely integrated, thereby improving the economic efficiency of the fresh produce industry and promoting the innovation and upgrading of the fresh produce industry.

3. System Dynamics Overview

3.1 The Concept of System Dynamics

System dynamics is a comprehensive discipline that combines systematic theory with computer technology to study the feedback structure and internal structure of the system. It was founded in 1956 by Professor Forrest of the Massachusetts Institute of Technology. The early name of this discipline was called industrial dynamics. In the early days, it was mainly used to study production management and inventory management, and to deal with fluctuations in production and employee conditions. The theoretical study of system dynamics is the unity of the structure, function and history of the system, and it integrates system theory, information theory and cybernetics. It is a comprehensive discipline.

3.2 Modeling Tools for System Dynamics

There are many tools for system dynamics modeling. This article uses Vensim software. Using Vensim software requires making a causal loop diagram, a stock flow graph, and entering equations and testing the model. Making a causal loop diagram is the first step in building a model. It is a loop that reflects the causal relationship between the various elements in the system. The first step in the production process is to analyze the causal relationship between the various elements and reuse it. The arrows are connected and then need to be observed clearly which of the loops formed positive feedback are and which negative feedback are. The causal loop diagram must have a trade-off relationship. These relationships form a complete causal loop diagram. Which one is enough to describe the causal relationship between the various elements in the system and form a loop? The production of the stock flow chart is the most crucial step in establishing the model. This process is to deepen the understanding of the internal structure of the system. On the basis of the causal loop diagram, the nature of the variables is distinguished. This process needs to distinguish the state variables, rate variables, and auxiliary variables. . After setting different variables, input the basic equations and parameters to the variables, and connect the variables with the mathematical relationship. The system becomes a dynamic model. After this work is completed, the model is tested. After the problem, carry out the model simulation run [7].

4. The Influence of the Development Level of Logistics Information System on the Profit of Fresh E-commerce

The system dynamics model established in this paper is from the perspective of perceived value of customers. Company. Since the variables existing in the model established by Vensim are quantitative variables, we use the number of logistics information system equipment to be applied to indicate the application degree of logistics information system. The more logistics equipment is invested, the higher the application level of logistics information system. The purpose of this paper is to study the impact of the application degree of logistics information system on the profit of fresh e-commerce. We mainly observe the development cost, the economic constraint coefficient and the coefficient of fresh change of goods in the model to observe the total operating income so as to summarize the general trend.

4.1 System Boundary

The whole fresh supply chain ecosystem includes fresh suppliers, e-commerce companies, consumers, etc. In the model, the total operating income of X enterprises is related to fresh goods sales revenue, logistics information system development costs and logistics costs. The income obtained will also be invested in the construction of the supply chain in a certain proportion.

To facilitate modeling, make the following assumptions:

H1: Does not consider the impact of changes in the macroeconomic environment on the system;

H2: Does not consider the impact of other external factors in X's daily operations;

H3: Assume that operating profit is only related to fresh goods sales revenue, development costs and logistics costs;

H4: Assume that the development cost of the unit quantity logistics system remains unchanged;

H5: Ignore the impact of supply and demand on prices;

H6: Suppose there is no shortage of consumers in the ten years of running the model;

4.2 Fresh Food Supply Chain Ecosystem Causal Loop Diagram

4.2.1 The Influencing Factors of Customer Perceived Value

This paper takes X company's logistics information system development degree as the starting point, and analyzes the influencing factors of customer perceived value as commodity price, fruit and vegetable meat freshness, product diversity, logistics quality, among which fruit and vegetable meat freshness and product diversity The logistics quality has a positive impact on the customer's perceived value, and forms a positive feedback loop with the customer's perceived value. The commodity price has a negative impact on the customer's perceived value, and forms a negative feedback loop with the customer's perceived value.

4.2.2 Causal Loop Diagram of Fresh Supply Chain System of X Enterprise

We begin to analyze the development level of logistics information system as the starting point. The development level of logistics information system will affect the price of goods, the freshness of fruits and vegetables, the diversity of products, etc., thus affecting the perceived value of customers, and then the perceived value of customers will affect the number of consumers, the increase in consumers will increase the sales revenue of X enterprises, increase the total revenue of enterprises, and increase the total income to invest more in the development of logistics information systems.However, The higher degree the development of logistics information systems is, the higher the development cost will be, which will cause the company's profit decrease to a certain extent. For ease of observation, we use Vensim software to make a causal loop diagram as follows.

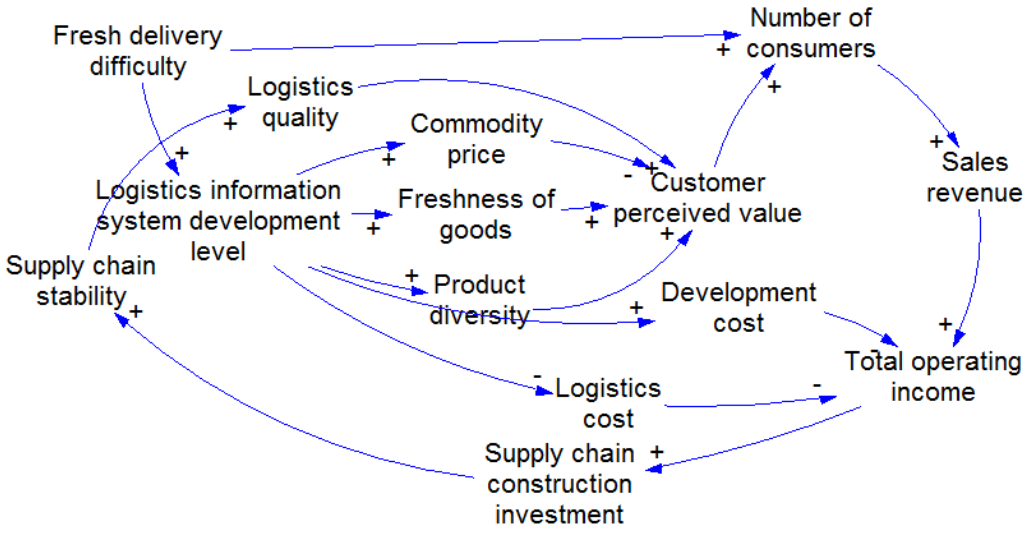

Fig 1. Causal circuit diagram

4.3 Stock Flow Chart

In the previous section, we analyzed the causal relationship between the elements of the causal loop diagram, but the causal graph cannot represent the difference between variables of different nature. Therefore, we need to further analyze and convert the key variables into state variables and increase Rate variable. In the process of stock flow, the three variables of logistics information system, number of consumers and supply chain stability are the most important variables in the fresh supply chain and need to be analyzed. Therefore, they are set as state variables. On the basis of the causal loop diagram, add the necessary variables to create a stock flow chart, as shown in the Fig.2.

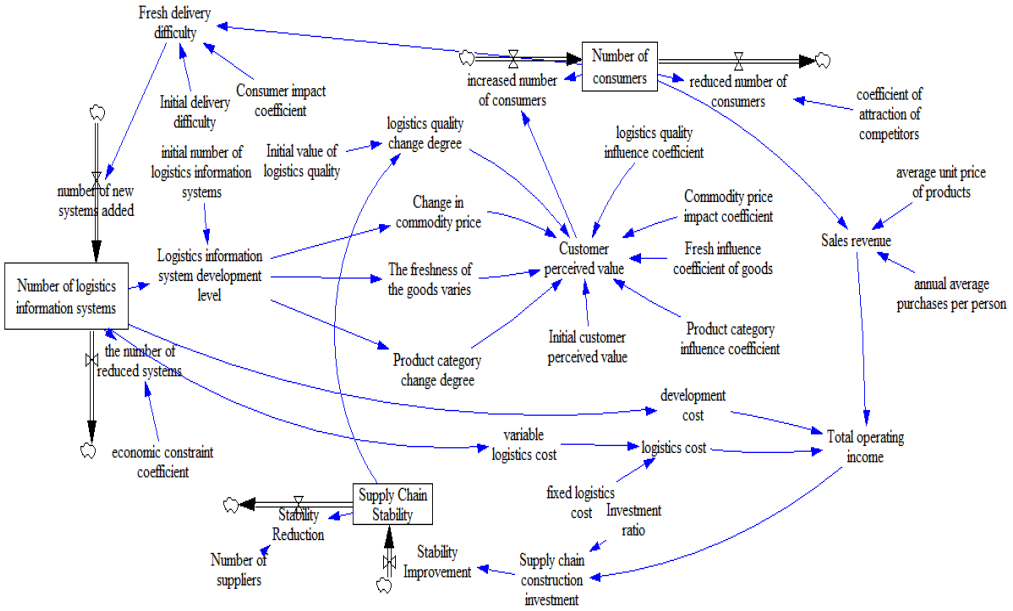

Fig 2. Stock flow chart

4.4 Basic Equations and Parameter Settings

Number of logistics information systems = number of new systems added - the number of reduced systems

Number of new systems added=30*LN (fresh delivery difficulty)

The number of reduced systems=Number of logistics information systems* economic constraint coefficient

Logistics information system development level = number of logistics information systems / initial number of logistics information systems

Initial number of logistics information systems=100

Change in commodity price = degree of development of logistics information system *0.3

Commodity price impact coefficient = 0.25

Freshness of goods = degree of development of logistics information system *0.4

Fresh influence coefficient of goods=0.23

Product category change degree = Logistics information system development degree *0.5

Customer perceived value = Initial customer perceived value + (new change of goods * fresh influence coefficient of goods + product type change degree * product type influence coefficient + commodity price change degree * commodity price influence coefficient + logistics quality change degree * logistics quality influence coefficient) * Initial customer perceived value

Initial customer perceived value=1

(13) Number of consumers = increased number of consumers - reduced number of consumers

(14) Increased number of consumers = number of consumers * customer perceived value * 0.05

(15) Reduced number of consumers = number of consumers * coefficient of attraction of competitors

(16) Competitor attraction degree coefficient = 0.06

(17) Fresh delivery difficulty = initial delivery difficulty * number of consumers * consumer influence coefficient

(18) Initial delivery difficulty=1

(19) Consumer Impact Factor = 0.4

(20) Sales revenue = number of consumers * average unit price of products * annual average purchases per person

(21) Total operating income = sales revenue - logistics cost - development cost

(22) Development cost = number of logistics information systems *20000

(23) Logistics cost = fixed logistics cost + variable logistics cost

(24) Fixed logistics cost = 5*100000

(25) Change logistics cost = 3*1e+007/SQRT (SQRT (number of logistics information systems))

(26) Supply chain construction investment = total operating income * investment ratio

(27) Investment ratio = 0.15

(28) Supply Chain Stability = Stability Improvement - Stability Reduction

(29) Stability reduction = supply chain stability * number of suppliers / 500

(30) Number of suppliers = 25

(31) Stability improvement = (2.5 * 10000) * SQRT (supply chain construction investment) / supply chain construction investment

(32) Logistics quality change = supply chain stability / logistics quality initial value

4.5 Simulation Analysis of Fresh Supply Chain System

The model established in this paper is to study the impact of the degree of development of logistics system on the total operating income of X enterprises. The time span is 10 years. The logistics information system, the number of consumers, the stability of supply chain are taken as the horizontal variables.The related rate variables and auxiliary variables are determined according to the three horizontal variables, forming a closed loop between the determined variables, so it can be determined that the boundary of the model is reasonable.

4.5.1 Model Simulation Analysis

Through the debugging model, the model is adjusted to a more realistic state. From the results, the total operating income of X enterprises has decreased slightly and then increased rapidly. If the degree of development of logistics information systems has been improved to a limited extent, although the development of enterprises has been slow in short-term, it will be very helpful to the future operation of X enterprises. In order to further explore the impact of the logistics information system development strategy on operating income, the basic equations in the development cost, economic constraint coefficient and the freshness varies of the goods of the original model will be adjusted separately.

The impact of the development cost of logistics information system on total operating income

The development cost of logistics information system can be said to be the most concerned part of logistics information system development strategy. Because the complexity of logistics information system is different, different system development costs are different. Under actual circumstances, the system development cost can be estimated according to the development difficulty of the logistics information system, and the corresponding development strategy can be made. Now adjust the development cost to 100000, 300000, and 500000, run the model, and get the following results:

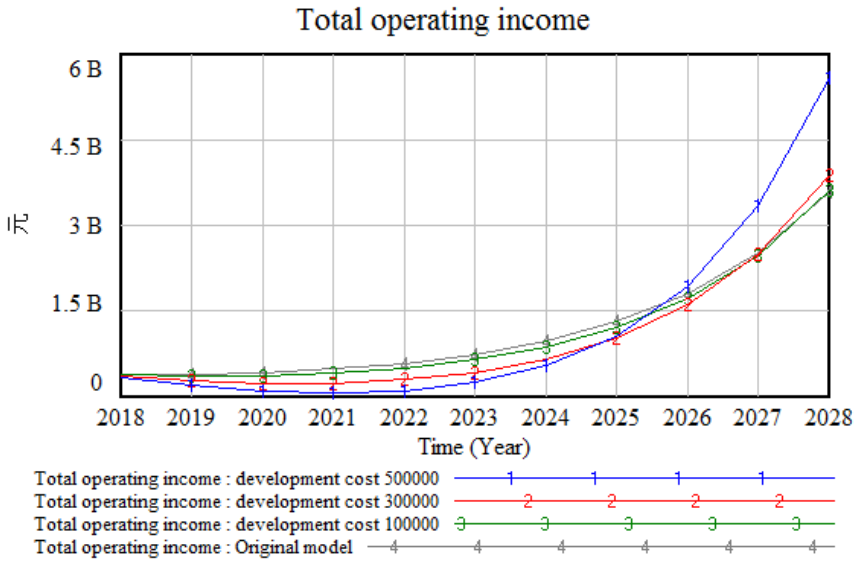

Fig 3. Adjustin the development cost

From the above results, when the funds are invested in the system development, the system development cost is higher, and the income in the first few years is relatively low, but the subsequent revenue growth is faster than when system development costs were lower. From this point of view, enterprises need to decide whether to put capital into production according to the system development cost. When the logistics information system is more complicated and the system development cost is higher, the enterprise needs to see whether its economic base is sufficient to support the operation in recent years. Overestimating its own economic strength and blindly developing and applying logistics information systems may lead to companies failing to survive the years of low earnings and causing corporate collapse.

The influence of economic constraint coefficient on total operating income

The economic constraint coefficient refers to the proportion of equipment that has to be reduced due to economic factors or the cost of repairing the system during operation is too large to abandon repair. The economic constraint coefficient is now adjusted to 0.3, 0.5, 0.7, and the changes in total operating income are as follows:

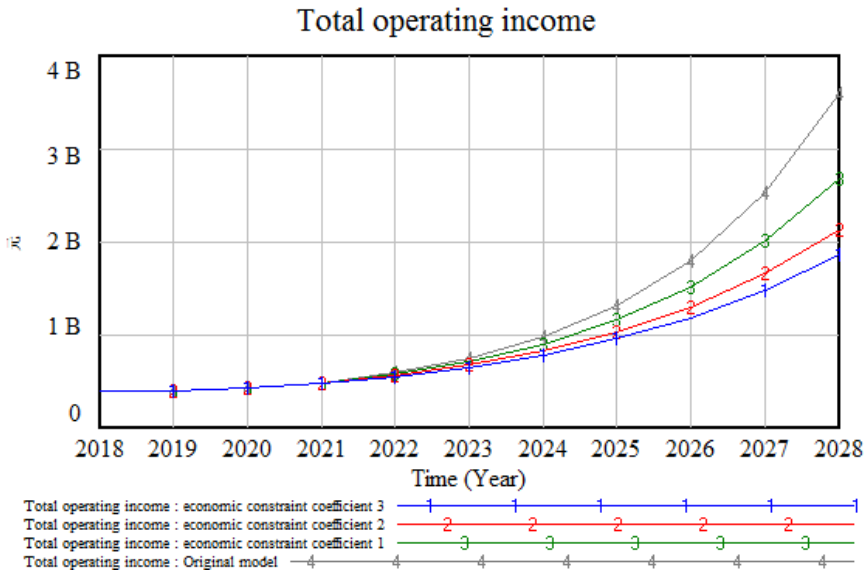

Fig 4. Adjustin economic constraint coefficient

From the results of the operation, when the economic constraint coefficient increases, the overall operating income of the enterprise is decreasing. Therefore, in order to reduce the impact of economic factors, the cost of controlling the operation and maintenance of the system should be done as much as possible during the development of the system. The potential method can be to increase the development investment or introduce more advanced technology.

The impact of the degree of fresh change of goods on total operating income

The most important point in the fresh logistics process is to ensure the freshness of the goods. The application of the logistics information system in the fresh logistics can effectively improve the efficiency of fresh storage and transportation and ensure the freshness of the products. Therefore, the coefficient of change in the degree of freshness caused by the change in the degree of development of the logistics information system was modified and adjusted to 0.4, 0.6 and 0.8, respectively, and the following results were obtained:

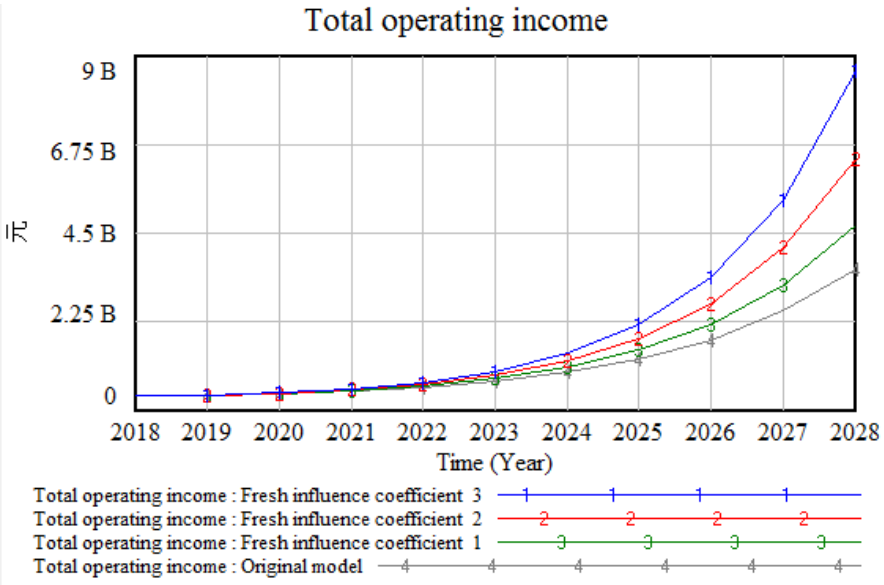

Fig 5. Adjustin the coefficient of change in the degree of freshness

From the results of the model operation, after increasing the freshness of the goods, the total operating income of the company is also increasing. We can get inspiration from it that the logistics information system applied in fresh logistics must be suitable for the completion of logistics links, and effectively improve the freshness of products in the warehousing and transportation sectors. If the application of the logistics information system can greatly improve the freshness of the products when the customer

receives the goods, then within a certain range, the company should increase the investment to develop the logistics information system.

5. Summary

At present, fresh e-commerce faces many difficulties, mainly because it is difficult to control the supply chain of fresh product procurement, warehousing, transportation, etc., and the application of logistics information system can more rationally control these processes and effectively alleviate the negative effects of particularity of fresh products. The application of logistics information system should be analyzed in detail according to the company's own situation, and the development strategy of logistics information system suitable for oneself can solve the problem. This paper uses the theory and knowledge of system dynamics, combined with Vensim software to simulate the fresh supply chain to study the impact of the degree of logistics system development on the profitability of fresh e-commerce enterprises. The model modifies the development cost of logistics information system, economic constraint coefficient and the coefficient related to the degree of fresh change of goods, to observe the trend of changes in total operating income, so as to develop relevant logistics information system development strategies.

References

[1] Jin J. Business Model of China's E-commerce Enterprises[J]. 2015.
[2] Song S H. Research on Development of Cold- chain Logistics of Fresh Electricity Business [J]. Logistics Engineering & Management, 2016.
[3] Xuegong L I, Meili Q I, Management S O. Fresh Electricity Supplier Cold-chain Logistics Cost Control [J]. Agricultural Economics & Management, 2016.
[4] Li H, Logistics S O. The Development Status and Countermeasures of Cold Chain Logistics under the Background of Fresh Food E-commerce [J]. Journal of Anhui Radio & Tv University, 2018.
[5] Marko Andrejic, Marjan Milenkov, Vlada Sokolovic. Logistics information system [J]. Military Technical Courier, 2010, 58 (1):33-61.
[6] Rong C. Research on Modeling of System Dynamics of Management of Green Supply Chain [J]. Sci-tech Innovation and Productivity, 2012.