Research on Agricultural Product Logistics Information System Based on "Internet +" Modularization

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Abstract. With the proposal of "Internet +" concept and the progress of modern logistics technology, "Internet + agricultural products" continue to occupy the mainstream field, logistics information service system is also constantly upgraded, under the "Internet +" concept, the modular method to sublimate. "Internet Plus" is not only a novel idea, but also a trend idea. It is born in line with the trend of information technology. The " +"of "Internet +" is reflected in grafting the Internet concept into all walks of life. The emergence and growth of the demand for characteristic agricultural products logistics has put forward higher requirements for the logistics service ability of traditional logistics enterprises, especially large enterprises. Therefore, it is particularly important to study the agricultural products logistics information system based on the "Internet +" modularization.

Keywords: Internet Plus; Agricultural product logistics; · "Internet Plus" modularization: information system

1   Introduction

In recent years, with the continuous development of "Internet +" technology in agricultural product logistics, the country in order to accelerate the strategic adjustment of traditional agriculture, promote the innovative development of agricultural product circulation industry, It has issued a series of guiding opinions of The State Council on Actively promoting the "Internet Plus" Initiative, and Opinions of The State Council on Vigorously Developing E-commerce and Accelerating the Cultivation of New Economic Drivers, providing a sound policy environment for the transformation and upgrading of the agricultural products and logistics industry. Various beneficial policies issued by the state encourage agricultural operators to develop agriculture and sell agricultural products through the Internet. However, due to the lack of specific reference standards, the existing system of "Internet +" agricultural product logistics has many unsatisfactory aspects. The key technologies in "Internet Plus" are analyzed based on "Internet Plus" modular agricultural product logistics.

This topic takes agricultural product logistics as the research object, based on the "Internet +" technology, discusses the problem analysis of agricultural product logistics,

combined with the analysis of key technologies, through the comprehensive analysis of agricultural product logistics, summarizes the characteristics of agricultural product logistics, on the basis of comprehensive consideration of the logistics information needs of agricultural products in each link, the "Internet +" technology into the system. The agricultural product logistics information system is studied.

2 Problems Existing in the Development of Agricultural Products Logistics Information Platform

2.1 Existing Problems

1) The city has not yet built a feasible agricultural product logistics information platform

Due to the constraints of objective factors such as backward economic level and logistics technology level, weak information infrastructure, and insufficient government attention to platform construction and support, the city has not yet built an effective and open agricultural logistics information platform [1].

2) Lack of unified information processing specifications and platform construction standards

In the process of information processing and platform construction, municipal logistics enterprises and relevant government departments all rely on their own standards and norms, so the information formats and platform interfaces are different, information sharing and transmission cannot be realized, and users cannot fully grasp the market information of agricultural products.

3) The construction of information platform is short of professional talents and funds

The municipal government does not pay enough attention to the construction of agricultural informatization, and the investment of funds is seriously insufficient, resulting in some platforms under construction or agent construction facing great obstacles in the construction process. What is more serious is that the municipal government lacks professional technical personnel engaged in the work of information platform and website, especially comprehensive talents who understand both computer information technology, logistics technology and agricultural technology. As a result, some functions of many information websites or platforms cannot be maintained normally and regularly, which seriously restricts the construction of information platforms and resource sharing [2].

3 Modular Modeling Under "Internet +"

3.1 DSM Modeling Method

Model modeling procedure.

Through the analysis of modeling methods, this paper uses the DSM model modeling method under "Internet +" to complete the modeling of logistics information system.

DSM model modeling method, also known as Design Srcture Matrix method, through the establishment of DSM model, the relationship between modules in the system will be presented in matrix form. In the DSM model, the values of the rows and columns of the

matrix represent the degree to which the fourth system module is connected to the fourth system module, respectively, and are represented numerically. After modeling, a series of matrix transformation can be used to arrange and combine the system submodules in order to achieve the relative balance of the system, which is actually to split and aggregate the tasks of the system submodules. Through DSM modeling, the fluency and efficiency of the system can be greatly improved, and obstacles in the use of the system can be avoided [3].

In logistics information system, warehousing business process is the submodule, so it is reasonable to choose task-based DSM matrix. Each submodule represents an operation process, and the combination of all submodules constitutes the whole logistics information system.

Specific modeling steps are shown in Fig. 1:

In the DSM modeling process, according to the actual business requirements of the logistics information system, the specific business modules are defined, and the new customer-oriented business modules are defined according to the requirements of external customers of the logistics information system [46]. After combining the two, all modules are assumed to have a total of one. Then, the module defined by DSM structure design matrix is arranged according to the degree of correlation between modules, and the ranks are listed as the order matrix of elements [7–9]. This is the DSM structure design matrix in the early stage of system optimization. The values of the rows and columns of the matrix represent the degree of connection between the fourth system module and the fourth system module respectively ($0 \leq \leq, 0 \leq \leq$).

In order to facilitate calculation, the value with the strongest degree of connection is usually set as 3, the value with the medium degree of connection is set as 2, the value with
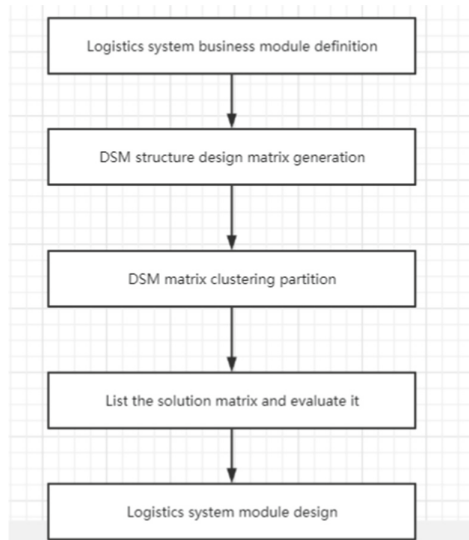

Fig. 1. Flowchart of DSM model modeling

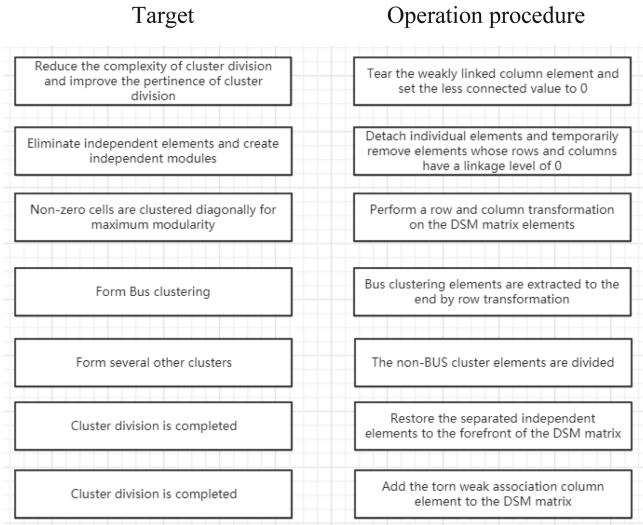Target   Operation procedure

Fig. 2. Steps of DSM structural design matrix clustering division

the low degree of connection is set as 1, and the value without the degree of connection is set as 0 [10–13].

After the DSM structural design matrix is established, the elements in the matrix are divided into row and column elements, which can be divided into Bus clustering elements (elements that have a certain degree of connection with most elements), ordinary clustering elements and independent elements[14–16].

After the above modeling preparation work is completed, the DSM structural design matrix is divided into clusters, as shown in Fig. 2.

Target Operation procedure.

Through the above-mentioned steps of DSM matrix clustering division, multiple schemes are usually obtained, and then different schemes need to be evaluated to get the final design scheme of logistics information system module.

3.2   DSM Model Modeling Clustering Scheme Evaluation

Suppose the scale of a DSM matrix, and the values of the elements whose columns and rows are respectively, are denoted as, is the relation degree value of the elements in the row and column of the DSM matrix. For the general clusters in DSM matrix, denoted as,…, set the position of the first and last clustering element in any clustering as and (1 ≤ ≤ ≤), and its clustering scale as. Similarly, for Bus clustering, the clustering scale of any Bus clustering is (1 ≤ ≤ ≤) [17].

Clustering scheme evaluation is carried out under the above algorithm definition. The evaluation calculation steps are as follows:

(1) In the DSM matrix above, the information of the degree of connection is calculated by Eq. (1):

$$W_i^{(in)} = 1/2 \times (n_i - m_i + 1) \times \sum_{l=0}^{(n_i - m_i)} \sum_{k=0}^{(n_i - m_i)} \left(d_{m_i+k, m_i+1} + d_{m_i+l, m_i+k} \right) \quad (1)$$

(2) In the DSM matrix, the total amount of information about the overall linkage degree of general clustering is calculated by Eq. (2):

$$W^{(in)} = \sum_{i=1}^{N} W_i^{(in)} \tag{2}$$

(3) The total amount of information of Bus clustering in the model is calculated by Equation

$$W_b^{(in)} = 1/2 \times (n_b - m_b + 1) \times \sum_{l=0}^{(n_b-m_b)} \sum_{k=0}^{(n_b-m_b)} \left(d_{m_b+k,m_b+l} + d_{m_b+l,m_b+k}\right) \tag{3}$$

(4) For general clustering CL_i and CL_i, , the information of the degree of connection between them can be calculated by (4). Where, the influence of the number of general clustering on the total amount of information of the degree of connection between them can be expressed as $\alpha=0.65$ [18].

$$W_{i,j}^{(out)} = \begin{cases} \alpha \times (N+1) \times \left(n_i - m_i + n_j - m_j\right) \sum_{k=0}^{(n_j-m_j)} \sum_{l=0}^{(n_i-m_i)} \left(d_{m_j+k,m_i+1}\right), i \neq j \\ 0, \ i = j \end{cases} \tag{4}$$

(5) The information of the degree of connection between common clusters in the model can be calculated by Eq. (5), in which, it can be calculated by Eq. (4):

$$W^{(out)} = \sum_{i=1}^{N} \sum_{j=1}^{N} W_{i,j}^{(out)} \tag{5}$$

(6) Formula (6) is used to calculate the degree of information of connection between Bus clustering and ordinary arbitrary clustering:

$$W_{b,i}^{(out)} = (n_b - m_b + 1) \times (n_b - m_b + n_i - m_i) \times \sum_{k=0}^{(n_b-m_b)} \sum_{l=0}^{(n_i-m_i)} \left(d_{m_b+k,m_i+1} + d_{m_b+1,m_i+k}\right) \tag{6}$$

(7) In the DSM model, the information of the degree of connection between Bus clusters is calculated by Eq. (7), which can be calculated by Eq. (6):

$$W_b^{(out)} = \sum_{i=1}^{N} W_{b,i}^{(out)} \tag{7}$$

(8) The information of the overall linkage degree of DSM model clustering can be calculated by Eq. (8):

$$W = W^{(in)} + W^{(out)} + W_b^{(in)} + W_b^{(out)} \tag{8}$$

According to the above-mentioned DSM model evaluation scheme, the scheme with the smallest amount of information of overall connection degree was selected as the final DSM modeling scheme, and the overall module design of the warehouse system was completed.

4   Conclusion

This paper focuses on the analysis of agricultural products logistics problems and solutions. This chapter analyzes and studies the optimization modeling method of logistics information system under "Internet +", expounds the concept, significance and value-added logistics services of "Internet +", analyzes the modular method, modeling perspective and modeling method under "Internet +", and studies the modular modeling technology under "Internet +". In particular, the DSM model modeling method suitable for this paper is selected as the main modeling method. It provides the key technology method for the optimization design of logistics information system module.

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