Development of Information Service Platform for the Transfer and Transformation of Agricultural Special Scientific and Technological Achievements Based on PHP

Zhe Zhang[1(✉)], Youwen Zhang[2], Liling Xu[1], and Jian Fang[3]

[1] Shandong Institute of Commerce and Technology, Jinan, Shandong, China
zhangzhe0531@163.com
[2] Jilin University, Changchun, Jilin, China
[3] Jinan No.1 High School in Shandong Province, Jinan, Shandong, China

Abstract. The transfer and transformation of agricultural special scientific and technological achievements, as the core link of overall agricultural scientific and technological innovation, plays an important role in solving the "three rural issues" and accelerating the modernization of agriculture and rural areas. In this regard, based on the problems of low efficiency and old mode in the transfer and transformation of agricultural special scientific and technological achievements, this paper puts forward a set of construction scheme of network information service platform, which provides necessary service support for the transfer and transformation of agricultural achievements and promotes the upgrading and transformation of service mode in a networked and digital way. The network information service platform belongs to B/S architecture, and the front end is a comprehensive function page, which supports multiple users to complete interactive operations. The back-end server is built by ThinkPHP framework. The system focuses on adding recommendation function module based on TF-IDF algorithm model in the aspect of demand matching to improve the exchange rate of information. After simulation test, all functions of the platform run smoothly, which accelerates the efficiency of information circulation and interaction and promotes the revitalization, configuration and transformation of agricultural special scientific and technological achievements.

Keywords: agricultural special scientific and technological achievements · transfer and transformation service mechanism · information service platform · PHP · computer software application

1 Introduction

With the deepening of social informatization, the overall development trend of China's agriculture has gradually shifted from resource-dependent to technology-driven [1]. Accordingly, the demand characteristics of agricultural special scientific and technological achievements have also shown obvious changes. As a complex systematic project, the

transfer and transformation of agricultural scientific and technological achievements is characterized by long-term, regional and high risk. In the process, the scientific research institutions, agricultural science & technology extension departments and various types of agricultural production and operation individuals are involved, so that the transfer and transformation of agricultural scientific and technological achievements are easily disturbed by various factors such as operating mechanism, service mode and information exchange, resulting in the problem of low transfer and transformation efficiency [2]. In view of this, this paper believes that local governments at all levels should fully realize the practical characteristics of digital information technology in service model reform and service process reshaping, and build a Web-based information service platform for the transfer and transformation of agricultural special scientific and technological achievements. It provides necessary technical support for the transfer and transformation of agricultural special scientific and technological achievements, and promotes the revitalization, allocation and transformation of agricultural special scientific and technological achievements [3]. As a comprehensive data and service aggregation system, the network information service platform eliminate the influence of information barriers and data islands on transformation efficiency, open up a brand-new business model, and make a useful attempt to create a new ecology for the transfer and transformation of agricultural special achievements.

2   Development Process

The overall development content of the information service platform for the transfer and transformation of agricultural special scientific and technological achievements includes two parts: functional structure design and basic framework construction. The functional structure of the platform can be divided into four parts from top to bottom: client, application layer, service layer and data layer [4]. Under the functional structure of the platform, the client directly provides the user interface; The application layer is responsible for business logic control; The service layer can provide specific reusable service functions; The data layer supports the platform to store and access data information. Each layer is independent and interrelated to form a complete data flow path, which constitutes the logical order of the normal operation of the platform [5]. For the basic framework, the building process consists of front-end interactive pages and back-end servers. The front-end interactive page is mainly designed and developed with Bootstrap framework. The development and deployment of the back-end server is realized by ThinkPHP framework, and follows MVC design pattern, and the front-end interactive interface and the back-end server are associated and connected under a specific data interface [6]. The basic development environment is "LAMP" mode, that is, the operating system is Linux CentOS 7.3, the development language is PHP 8.1.9, the integrated development tool is PHPStorm 2020.1, the Web server is Apache 2.4, and the database is MySQL 5.7. Through the introduction of the above key technical theories, the overall environment of system development, the configuration of related software and tools are determined, and the technical feasibility of the information service platform for the transfer and transformation of agricultural special scientific and technological achievements is also clarified.

3 Functional Implementation

3.1 Login and Home Page

The information service platform for the transfer and transformation of agricultural special scientific and technological achievements will preset multiple role users according to actual needs. Different roles can complete registration and identity verification through account application, and complete login and use of the system with unique identification information [7]. Under the homepage interface, the platform will display the relevant national policies and regulations, internal information of the industry, and the display of key agricultural scientific and technological achievements, so that users can browse and obtain them quickly.

3.2 Achievement Display

Under this functional module, the platform can classify all agricultural special scientific and technological achievements, form a multi-layer tree structure, and improve the efficiency of application management. In addition, the platform also integrates the applicable areas, publishers and intellectual property information of various agricultural special scientific and technological achievements into classified management, further enhancing the comprehensiveness and accuracy of the results display.

3.3 Supply and Demand Release

The platform introduces a content recommendation system, that is, an index database is established for all published supplier information and demander information, and key classified information, applicable areas, publishers, demanders and intellectual property information are transformed into separate index items. When users publish supplier information or buyer information online, the system will automatically perform word segmentation according to the input text content, and use TF-IDF formula to convert the text content into a similarity calculation vector, and then use cosine similarity calculation formula to obtain highly similar index items in the index database, complete content recommendation, and realize rapid matching of supply and demand information. As shown in Formula 1, it is the calculation formula of TF-IDF, where W represents similarity weight, TF represents the frequency of keywords appearing in the index database, IDF represents the inverse frequency of index items containing keywords in all index items in the index database, f represents the frequency of keywords appearing in the index database, $c(T)$ represents the total number of index items in the index database, n represents the total number of index databases, and m represents the number of index databases where keywords appear [8].

$$W = TF * IDF, \ TF = \frac{f}{c(T)}, \ IDF = \log \frac{n}{m} \qquad (1)$$

The cosine value can be calculated by Euclid's dot product formula, as shown in Formula 2. Among them, A and B represent two text contents respectively, and S represents

Table 1. Results of the TF-IDF algorithm calculation

Words	Index library occurrence times	TF	IDF	TF-IDF
Rice	20	0.041	1.657	0.067
Japonica rice	40	0.126	1.376	0.173

Table 2. Calculation results of TF-IDF algorithm

Algorithm model	Consistency	Perplexity
TF-IDF	0.69	−0.94
Bag of Word	0.61	−0.88
Mallet	0.57	−0.82

cosine value, which also refers to the similarity of the two text contents [9].

$$S = \cos(\theta) = \frac{\sum_{i=1}^{n} A_i \times B_i}{\sqrt{\sum_{i=1}^{n} (A_i)^2} \times \sqrt{\sum_{i=1}^{n} (B_i)^2}} \tag{2}$$

After the platform is built, the core TF-IDF algorithm will be tested according to the functional characteristics of the recommendation system. The supplier information of "Nanjing 98 Rice" is selected as the test object, in which the total number of words in the document is 1366, "Rice" appears 56 times, "Japonica rice" appears 172 times, the total index database is 1000, the buyer information related to "Rice" appears 21 times, and the buyer information related to "Japonica rice" appears 41 times. The calculation results of TF-IDF algorithm are shown in Table 1. The comparison and evaluation results of similar algorithms are shown in Table 2. The simulation test results show that TF-IDF algorithm has the highest consistency and the lowest confusion when dealing with the supplier information of "Nanjing 98 Rice". The better the clustering effect of the corresponding text content, the higher the accuracy, and the function of the recommendation system meets the design requirements [10].

4 Conclusions

In order to promote the reform of the service mode of agricultural special scientific and technological achievements transfer and transformation, this paper puts forward a set of construction scheme of network information service platform in view of the shortcomings of service mechanism, achievement supply and transformation efficiency. It provides necessary service support for the transfer and transformation of agricultural achievements, and promotes the upgrading and transformation of service mode in a

networked and digital way. In the follow-up research, it will further enrich the functional items of the platform, realize remote video online training, improve the data security performance of the platform, and really make positive contributions to the transfer and transformation of agricultural special scientific and technological achievements in the new period.

References

1. Qiao Liqun. Research on China's Agricultural Industry Transformation and Policy Support Strategies[J]. Heilongjiang Finance.2019.10.
2. Wu Lifeng. Analysis on the Problems and Countermeasures in the Transformation of Agricultural Scientific and Technological Achievements in China[J]. Shanghai Rural Economics.2022.10.
3. Wang Xiaoli, Kou Qiuwen. Analysis on the Mode, Present Situation and Countermeasures of Agricultural Science and Technology Achievements Transformation in China in the New Era[J]. Management of Agricultural Science and Technology.2021.08.
4. Han Yinghong. Application of Web Development Technology in Software Engineering[J]. Digital Communication World.2022.07.
5. Huang Jilin. Application of Database and Web Technology in Website Construction[J]. Electronic Technology.2023.01.
6. Peng Wanli. Construction and Application of Website Cluster Based on ThinkPHP[J]. Information & computer.2019.03.
7. Gu Shunli. Design and Implementation of Responsive Web Page Based on Bootstrap Framework[J]. Information Recording Materials.2022.11.
8. Gong Yonggang, Guo Yuannan. Chinese Text Automatic Summarization Model Based on TF-IDF and Word2Vec[J]. China New Telecommunications.2023.01.
9. Zhang Junfei. Improved TF-IDF Combined with Cosine Theorem to Calculate Similarity of Chinese Sentences[J]. Modern Computer.2017.11.
10. Tang Yu, Tang Jiashan. An Improved TF-IDF Text Classification Algorithm[J]. Information Technology and Informatization.2022.03.