

Design and Implementation of Entrepreneur Evaluation and Analysis System Based on AHP Method

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Abstract: The evaluation of entrepreneurs has a great influence on the brand awareness and the attractiveness of investors, which in turn can affect the performance of an enterprise. Therefore, this paper uses javaweb technology to develop an entrepreneur evaluation and analysis system, systematically uses AHP method and designs related algorithms to analyze the influencing factors of entrepreneur evaluation, and systematically judges entrepreneur evaluation in a scientific way according to the judgment matrix and the results of

Keywords: AHP, Javaweb, Entrepreneur Evaluation, Application System Design.

1 INTRODUCTION

With the continuous development of market economy and the continuous improvement of China's modern enterprise system, more and more private entrepreneurs emerge in an endless stream, contributing to the development of China's economic market, and the talents of entrepreneurs have strategic marketing for China's current economy and society. Under the background of the Internet technology era, with the rapid development of the Internet, the evaluation of entrepreneurs is becoming more and more networked, and the evaluations of entrepreneurs spread rapidly on the Internet, which will have an important impact on brand reputation. Therefore, it is of great significance for the development of China's market economy to study the evaluation of Chinese entrepreneurs and deepen the reform of enterprises. In China's existing entrepreneur evaluation, the method is traditional, the index system is not comprehensive, and there are some problems of pertinence and intersection. Therefore, we need to study a more scientific evaluation system for entrepreneurs. According to the above content analysis, the author of this paper thinks that the Internet technology and AHP method should be used to study the entrepreneur evaluation and analysis system. The indicators come from the network and are displayed in the way of application system, which can reflect the evaluation of entrepreneurs more intuitively, reveal the evaluation status of entrepreneurs, find out their possible strengths and weaknesses, and provide empirical basis for consumers and investors. ^[1]

2 KEY TECHNOLOGY

2.1 Web

Web development technology mainly refers to web page development technology, which is a front-end web page development technology. The technical front-end is mainly developed by using the technical framework of HTML+CSS+JavaScript. JavaScript is an explanatory scripting language, and JavaScript is the most widely used front-end development technology, so most browsers have built-in JavaScript interpreters. The common tools of front-end development are development frameworks such as VUE.js, React and bootstrap to improve the efficiency of front-end page development. Especially under the technical premise of using HTML5 and CSS3, the page interaction and visual aesthetic effect can be greatly enhanced.

Compared with HTML, HTML5 has the advantage of adding a larger number of tag libraries and optimizing the functional design of form processing, which makes HTML5 technology more adaptable in the current era. In addition, HTML5 has the advantages of reducing the dependence of external plug-ins and supporting localized offline storage mode. Similarly, CSS3 is also an upgraded version of CSS. Compared with CSS, CSS3 technology has more module effects, such as language, list, background border and text effects. The advantage of increasing module special effects is that it can greatly reduce the number of HTTP requests, and at the same time reduce the redundancy of tags, thus enhancing the user experience. Web front-end development technology needs to combine ajax technology to realize the complete interaction of pages, and at the same time construct a bridge between the client and the server for asynchronous response. [2]

2.2 Java

Java is an interpretive development language based on object-oriented thinking. Java features include distributed, efficient and robust, cross-platform and open source. At the same time, Java also supports network programming and multi-thread programming, so Java has gradually become the most mainstream development language. C++ is the most widely used programming language in the previous generation. Compared with C++, Java abandons complex functions such as pointer and memory management, thus simplifying the development process and further improving the development efficiency. But Java is still a class-based development language, which has three characteristics: inheritance, encapsulation and polymorphism. Java language can inherit the old code to improve the reusability of the code; Encapsulation features can isolate the code into small segments, making it easier to use; Polymorphism can make the code more flexible in use. And because the program developed by Java language is dynamic, the application system developed by Java language can be upgraded freely in a distributed environment, and it is not limited by the application of the source program.

The Java application development process is shown in Figure 1. First, developers write the code of the source file, and then compile the source file with a compiler. In this process, bytecodes will be generated, and the bytecodes can be executed by an interpreter to complete the application development process. Based on the above analysis, the research and development of entrepreneur evaluation and analysis system is carried out in this paper based on JavaWeb. [3]

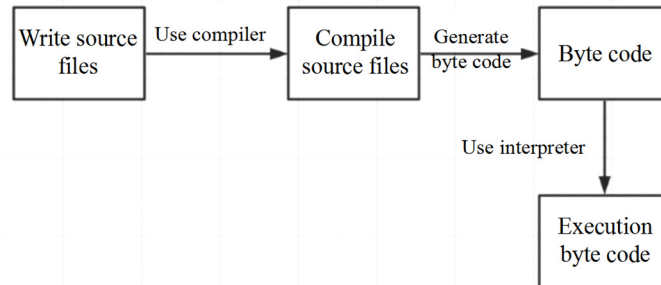


Figure 1: java application development process

2.3 AHP Method

Analytic hierarchy process(AHP) comes from professor Thomas L.Staaty in the United States. This analysis method is applied to the analysis of decision-making problems with multiple evaluation criteria and uncertain conditions. Decision makers can use AHP method to determine the priority of evaluation criteria and quantify decision variables according to their importance and decision variables, so as to calculate the best decision-making mode scientifically. The characteristic of AHP is that it can use less and quantitative information to mathematically calculate the thinking process of decision-making. In this process, the decision-makers need to deeply analyze the essential influencing factors and their internal relations of the problems in the decision book. AHP analytic hierarchy process can simplify the problems with multi-objectives, multi-criteria or no structural characteristics. Therefore, this paper uses AHP analytic hierarchy process to analyze entrepreneurs' comprehensive evaluation. [4]

2.4 Development Environment

The development language is JAVA 8, the development tool is IntelliJ IDEA, and the server uses Apache Tomcat8.0. The front-end development language of the system is HTML+CSS+JavaScript, the development tool is Vue.js combined with bootstrap, and ajax asynchronous request technology is used to complete the data interaction between the front and back ends. The page developed by ajax technology can refresh locally, which can improve the loading speed of the page and enhance the user experience. The back-end development framework of the system chooses the SSM framework structure of spring+springmvc+mybatis, which is the current mainstream. The choice of system architecture and key implementation technologies is very important. According to the analysis of the relevant technologies in the current era, it is considered that it is technically feasible to build an entrepreneur evaluation and analysis system based on the above technologies.

3 DEVELOPMENT PROCESS

The application system of entrepreneur evaluation and analysis based on AHP method is designed based on Javaweb technology, and the technical architecture of the system is shown in Figure 2. The system functions are designed in a hierarchical way. The system architecture

is divided into five layers: front-end framework, display layer, business layer, data layer and database. The complex system is divided into five layers, and the component modules with similar functions are divided into one level, and there is a gap between each level. The service is provided from the bottom level to the top level step by step. In turn, the top level obtains the information of the bottom level service through the corresponding information interface, and the coupling between the levels is low, so that it can achieve certain independence, which is more convenient for developers to expand and maintain later. Hierarchical design pattern can further improve the cohesion of the whole system.

The system is developed with the front-end separation mode, and the front-end framework adopts VUE, which is responsible for the view layer in MVC. Yii is responsible for the control layer and template layer of MVC pattern. The front-end framework adopts VUE, the front-end development language uses HTML+JS+CSS, and the static files of picture documents are saved. The display layer is rendered by browser and interacted with ajax technology. The data layer is responsible for the connection between the system and the database, including data backup, database reading and writing, information storage. Mybatis is the persistence layer framework, which calls the DAO interface to POJO JAVA objects. Spring is a framework for coupling business layer and other layers, and it is a lightweight java development framework. The configuration of springboot version can be better simplified. The MVC module of this system is built by Springmvc framework, which divides the model, filter and controller, making it easier to customize the system. [5]

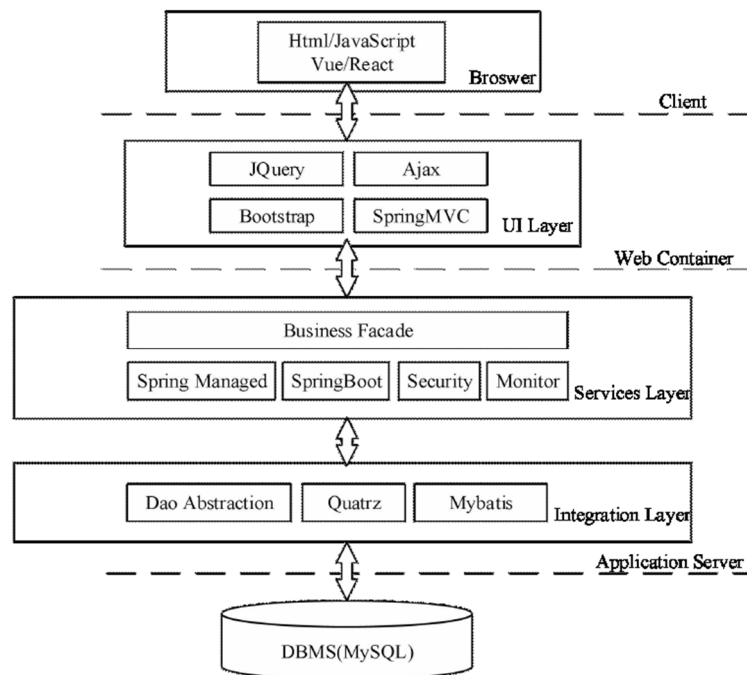


Figure 2: Technical architecture of application system design

4 FUNCTIONAL IMPLEMENTATION

After the user logs in the system through the account password, the entrepreneur's rating can be obtained by inputting the entrepreneur information specified by the system. The entrepreneur evaluation system needs high authority to access, so the function of judging the legality of user identity should be maintained. After the user inputs the corresponding account number and password data, the server receives the login request and calls the relevant interface required by the login function to verify the information data input by the user. In this paper, the class of login function is described, and the class diagram of login function is shown in Figure 3. You can see that the login function is mainly set in five categories. UserInfo is the main class, which is mainly responsible for the management of all kinds of basic information of users, and holds the attribute information of account and password required by users to log in. The LoginController class is used to handle the user's requests to the system, while the LoginService class is mainly used to handle the user's requirements in business logic. The LoginDao class is the related attribute that is responsible for the interaction between the database server and the system. Finally, the CheckFilter class, whose function is to verify the permissions of all kinds of requests issued by users and intercept erroneous requests in time.

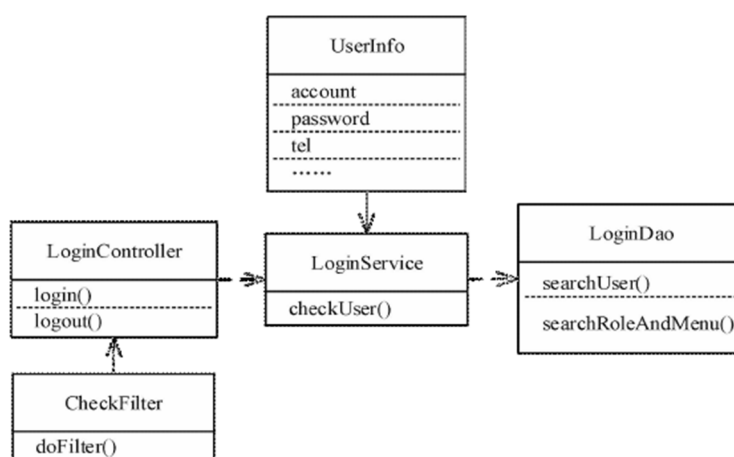


Figure 3: The accession functional class diagram

The enterprise price evaluation method of this system is AHP, which uses JAVA language to realize logic. In this part, the author will elaborate the concrete steps of AHP method. First of all, it is necessary to analyze the relationship between the factors in the entrepreneur evaluation system and establish the system. This paper adopts hierarchical structure. The hierarchical structure of this paper consists of three layers: the first layer is the target layer, the second layer is the criterion layer, the third layer is the index layer, and the index layer is divided into the first-level index and the second-level index. Based on the in-depth analysis of the characteristics of entrepreneurs, this paper concludes that the evaluation points of entrepreneurs are entrepreneur's ability level, entrepreneur's credit quality and entrepreneur's property capital. The evaluation index system of entrepreneurs is shown in Table 1.

Table 1: Entrepreneur evaluation index system

Target layer A	Criterion layer B_i	First-level index layer C_i
Comprehensive score index of entrepreneur evaluation	Entrepreneur character B_1	Honesty level C_1
		Credit record C_2
	Entrepreneur ability B_2	Debt paying ability C_3
		Performance ability C_4
		Profitability C_5
	Entrepreneur property B_3	Movable property C_6
		Real estate C_7

After building a good evaluation system, it is necessary to build a judgment matrix. The factors at the same level are compared with the criteria on the upper level, and the factors in the series are compared at the same level. For example, in this paper, the target layer A is compared with the criterion layer B, and the criterion layer B is compared with the first-level index layer C, etc. According to the result of the matrix, judge the relative importance of the element to the element at the next higher level. According to the matrix results, the relative weights under different criteria can be calculated. For example, the formula for the geometric average of each row in the matrix is shown in Formula (1).^[6]

$$\bar{w}_i = n \sqrt[n]{\prod_{j=1}^n a_{ij}}, i = 1, 2, 3 \dots n \quad (1)$$

We can get $\bar{w}_i = (\bar{w}_1, \bar{w}_2, \bar{w}_3 \dots \bar{w}_n)^T$ from the above formula, and then the relative weight of each index element can be obtained by normalizing the calculation of \bar{w}_i , which is also the approximate value of the required feature vector. In this process, the maximum eigenvalue of the established index matrix can also be calculated. The calculation formula is shown in Formula (2).

$$\lambda_{\max} = \sum_{i=1}^n \frac{(AW)_i}{nw_i} \quad (2)$$

After calculating the maximum eigenvalues and eigenvectors of the judgment matrix, it is necessary to check the consistency of weights and combinations, and sort the test results. Only after passing the test can normalization be carried out; otherwise, the matrix needs to be rebuilt for calculation. In this process, in addition to the eigenvector and sum value corresponding to λ_{\max} , it is also necessary to calculate the consistent ratio index. When the index value $C.R. < 0.1$, it is proved that the system can meet the requirements. The key parameter of consistency test is C.I. The formula of C.I is $C.I = (\lambda_{\max} - n) / (n - 1)$, and the ratio is $C.R. = \frac{C.I}{(R.I)C.I}$.

The smaller the C.R, the better the consistency of the system calculation. According to the calculation, the weights of the first-level indexes are as shown in Figure 4, $B_1=0.454$, $B_2=0.272$ and $B_3=0.274$, while the comprehensive weights of the second-level indexes are $C_1=0.418$, $C_2=0.263$, $C_3=0.301$, $C_4=0.296$, $C_5=0.315$ and $C_6 = 0$. According to the

corresponding comprehensive weight, the consistency result is $0.454 \times 0.0723 + 0.274 \times 0.92 + \dots + 0.274 \times 0.52 = 0.01638 < 0.1$, which can be inferred that the consistency of system calculation is up to standard.

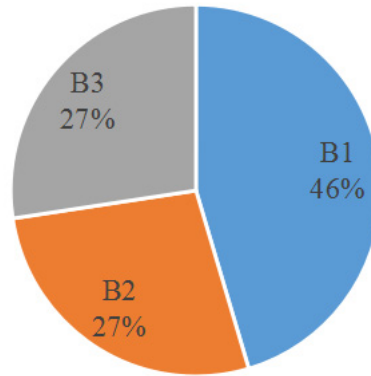


Figure 4: Weight proportion chart of first-level indicators

5 CONCLUSIONS

In this paper, the author uses AHP analytic hierarchy process to construct the evaluation and analysis model of entrepreneurs, which divides entrepreneurs into three evaluation systems: entrepreneur ability level, entrepreneur credit quality and entrepreneur property capital. By comparing and establishing judgment matrix, the weight is calculated, and the consistency test proves that the model is established. The establishment and application of this model not only provide investors with the scores of entrepreneurs, help investors to choose entrepreneurs scientifically, but also provide consumers with reference guarantee for consumption.

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