Construction of Online Teaching Service Platform for Human Resource Management Course under Javaweb Technology

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Abstract. With the development of digital economy, more and more enterprises begin to use digital information technology to realize the innovation and upgrading of human resource management, which enlarges the demand gap of human resource management talents with deep informatization. However, the personnel training of human resource management major in colleges and universities still follows the traditional mode, which leads to the problem of disjointed production and education. In this regard, taking the current teaching situation as the research object, this paper puts forward a scheme to establish an efficient and stable online teaching service platform for human resource management courses, aiming at building a new ecology of human resource management education that meets the needs of talent training in the digital age. The platform takes Javaweb technology as the core to complete the framework construction, and completes the design and development of various application modules according to the actual needs of students, teachers and users, forming a comprehensive Web application integrating data information and functional services. Practice has proved that the application modules such as remote access, live classroom, online teaching resource application, data analysis and processing operate normally under this platform, which is beneficial to the innovation of teaching mode of human resource management course and promotes the improvement of human resource management talent training system in colleges and universities.

Keywords: Javaweb technology; human resource management; online teaching service platform; software application

1 Introduction

In recent years, with the rapid progress of digital information technologies such as cloud computing, big data, artificial intelligence and Internet of Things, the process of digital transformation and upgrading of enterprises has been accelerating. [1] In the process of digital transformation, the organizational structure, workflow and cooperation between departments within enterprises will have new changes, and at the same time, new requirements will be put forward for the ability and role of employees, which will inevitably affect the human resource management of enterprises, and also put forward the direction for the transformation of scientific and digital human resource management system of enterprises. Facing the digital development trend of enterprise human resource management, there is an urgent need for a large number of human resource management practitioners with in-depth information ability

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to support the development strategy of enterprises. However, the training mode of human resource management talents in colleges and universities is relatively backward, and it is limited by such factors as outdated teaching content, single teaching means, insufficient professional teachers, and one-sided assessment and evaluation, so that the quality of talent training declines and the production and teaching are out of touch. [2] In view of this, this paper holds that under the background of Internet+education era, colleges and universities should promote the teaching mode reform of human resource management courses with more open teaching concepts and reshape the training system of human resource management professionals. [3] The online teaching service platform of human resource management course can give full play to the practical advantages of distance online education, live streaming courses and online teaching resources, and form a comprehensive Web program integrating data application and functional services to meet the actual needs of students, teachers and other users. It is beneficial to improve the teaching quality of human resource management, improve students' employment competitiveness and create a new ecology of human resource management education in the digital age.

2 System construction

The design and development of the online teaching service platform of human resource management course will be divided into two parts. One is to realize the online live broadcast function by using the streaming media technology framework, and the other is to complete the construction of the Web Server by using the Spring framework under the Java development environment, and to complete the design and deployment of the client interface with the VUE framework to form a standard Web application.

First of all, the live broadcast function architecture under streaming media technology consists of anchor, encoder, application server, CDN network, client and other modules, as shown in Figure 1. [4] Among them, the encoder adopts FFmpeg, which converts audio and video content into digital signals according to AAC algorithm and H.264 algorithm respectively, and completes the encapsulation to form a data stream. Then the encapsulated audio and video files are sent to the streaming media server according to RTMP protocol to complete the streaming operation. [5] When the streaming media server receives the streaming request from the player, it will automatically perform caching, scheduling and transmission operations to provide streaming media data to the player. In this system, Nginx-Rtmp-Module module is selected to build a streaming media server, and FFplay player is used to decode and play the data stream.

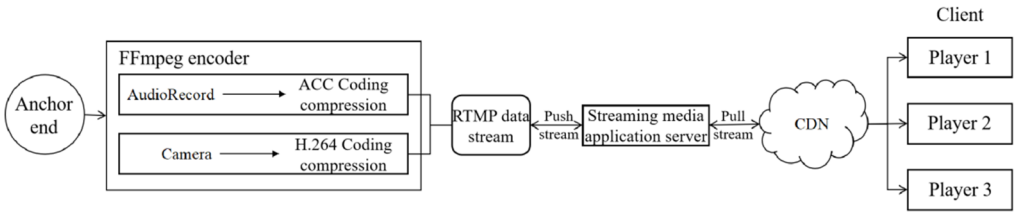

Fig. 1. Live broadcast function architecture

Secondly, for the development of Web applications, the overall environment is Java, and the JDK version is 1.8.0_181. The Web server is Apache 2.4.33, and the database is Mysql 5.7. Eclipse 2019 is selected as the development tool. After importing VUE framework and Spring framework, MVC creation and single entry file configuration are completed in turn, and the corresponding functional modules are finally selected to realize specific functions. [6] After the system is fully developed, it will be packaged and distributed to the server. After the corresponding ports are configured, users can log in from the client browser.

3 Functional implementation

3.1 Student side

Live class. The platform is B/S architecture and has a unified login interface, which is convenient for users to log in remotely through any client browser. After logging in, student users can view the relevant arrangements of live courses in the homepage interface, including teacher profile, course information, live broadcast time and course focus, which is convenient for student users to learn independently according to their own needs or preferences. When students enter the functional interface of the live classroom, they will watch it through the FFplay player in the page, and also have the functions of "play", "stop", "volume adjustment", "full screen" and "barrage". [7] Among them, student users can publish questions, courses and teachers' evaluations in text form through the "barrage" function, and the text content will be displayed simultaneously on the student side and the teacher side. When the teacher sees the barrage, the interaction between teachers and students can be carried out.

During the operation of the live classroom function of the platform, there is an obvious one-to-many relationship between the anchor and the client. The viewing experience of student users is easily affected by factors such as network bandwidth, total access and distribution of online stores, which leads to problems such as being stuck, delayed and disconnected. Faced with such problems, the system will set up a balanced load scheme of CDN network +Nginx reverse proxy server to achieve high concurrency control of the system. As a distributed network service, CDN network can complete the allocation of user requests by relying on various types of load balancing algorithms, thus reducing bandwidth consumption and accelerating content transmission. [8] Common load balancing strategies include polling, weighted polling, least connection, fastest response and hash calculation. Table 1 shows the advantages and disadvantages of each load balancing strategy and its applicable scenarios.

Table 1. Comparison of load balancing strategies

	Advantages	Disadvantages	Applicable scene
Polling	Static resources, stability	Fluctuations on the server side are inevitable	The server side has consistent processing capacity and high stability
Weighted polling	Static resources, stability, allowing performance differences		
Least connection	Dynamic, real-time	High complexity, connections need to be counted separately	The processing capacity of the server side fluctuates
Fastest response	Dynamic, real-time, sensitive request level	High complexity, response time needs to be counted separately	
Hash calculation	Function calculation stability	Affected by the client distribution	Frequent user requests

Take the polling strategy as an example. Its working principle is shown in Figure 2, that is, users' requests are distributed to multiple servers in a certain order, so as to realize the balanced distribution of requests. In the specific implementation process, the DNS server will sort the IP addresses of the servers, and when the user sends a request, the DNS server will return the IP addresses to the user in the established order, so that the user's requests are evenly distributed among the servers. [9] The following is the polling algorithm implementation code.

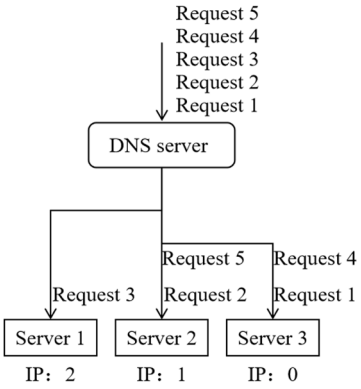

Fig. 2. Schematic diagram of polling strategy

```
 */class RoundRobin   {
   public static String getServer()
   {  Map<String,  Integer>  serverMap  =new  HashMap<String,
Integer>();
      serverMap.putAll(IpMap.serverWeightMap);
 Set<String> keySet = serverMap.keySet();
     ArrayList<String> keyList = new ArrayList<String>();
     keyList.addAll(keySet);  String server = null;
     synchronized (pos)
     {       if (pos > keySet.size())    pos = 0;
       server = keyList.get(pos);   pos ++;       }
```

In order to verify the actual use effect of CDN network adopted by the platform, three proxy servers and five back-end servers are set. Users request to enter the proxy servers at a speed of 0.5μs/ piece, and the back-end servers process requests at a speed of 150ms/ piece. The experimental results are shown in Table 2. The experimental results show that the polling algorithm has the best effect under the total number of 10000 requests, and can meet the requirements of system concurrency control.

Table 2. Statistical results of request processing delay

Algorithm	Average delay	Tail delay
Polling	97μs	109μs
Weighted polling	113μs	341μs
Least connection	118μs	189μs

Online teaching resources. The online teaching resources in the platform cover two parts: professional courses and extracurricular development courses. Rich and diverse online teaching resources can not only make up for the unreasonable curriculum and outdated teaching resources under the traditional teaching mode, but also fit the current habits of college students' online learning life, stimulate students' learning enthusiasm and improve learning effect. [10]

3.2 Teacher side

Teacher users have the right to use modules such as course management, online live broadcast and data statistics. Under the data analysis module, on the one hand, teachers can view the data of live courses, and on the other hand, they can evaluate the learning effect by relying on students' online learning data. Table 3 shows the statistical data of live courses, and Table 4 shows the evaluation data of student users' learning effect. The formula for calculating the weight of each learning behavior feature is shown in Formula (1), where λ_{max} represents the weight value, C represents the grade level, and W ranks the weight vector. [11] The test shows that the system can dynamically complete the course teaching evaluation, which changes the one-sidedness of the assessment and improves the timeliness of teaching management in colleges and universities.

Table 3. The statistical data of live courses

Live time	Live title	Viewer number (peak)	Per capita viewing time	Barrage number
23.04.03	Introduction to human resource management	1520	21.3min	2538
23.04.06	HR psychology	1455	20.9min	1974
23.04.11	Human resource development and management	1303	22.2min	2671

Table 4. Simulation and evaluation results of the learning effect

Evaluation target	Learning behavior characteristics	Weighted value	Feature vector	CI value	Item score	Score
Learning effect	Per capita viewing time	C1=0.237	0.921	0.013	70	14.275
	Viewer number (peak)	C2=0.417	0.983		75	38.729
	Barrage number	C3=0.211	1.116		66	14.688
	Number of interactions between teachers and students	C4=0.093	1.027		70	6.893
	Test result	C5=0.084	1.049		72	6.432

$$\lambda_{\max} = \sum_{i=1}^{n} \frac{(CW)_i}{nW_i} \quad CI = \frac{\lambda_{\max} - n}{n-1} \tag{1}$$

4 Conclusions

In order to promote the reform of the teaching mode of human resource management course in colleges and universities, this paper aims at many difficulties faced by the traditional teaching mode, and constructs an online teaching service platform of human resource management course based on Web, which provides a feasible solution to promote the digital and intelligent transformation and upgrading of the teaching mode. In the follow-up research, the system will further optimize the application stability of streaming media technology, increase the interactive means between students and teachers, and make contributions to the digital reform of career planning education in colleges and universities.

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