



Big Data Based Human Resources Professional Distance Training Platform

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Abstract. At present, the platform of human resources professional distance training and education, in the use of the process of training and education data, resulting in the platform response speed is slow, users wait for a long time, this paper proposed a big data-based platform of human resources professional distance training and education. Based on the functional characteristics of the big data platform, determine the functional modules of the platform and design the platform framework in consideration of the needs of the human resources profession for the distance training and education platform; deploy the network structure of the platform based on the intranet and extranet environment of the human resources profession; make full use of the big data platform to collect the data of the human resources professional training and education, and process the collected data; establish a platform database to store the information of the human resources professional training and education, and design the unified operation process of the database by considering the use needs of the database throughout the platform. The results show that the platform can automatically adjust the throughput of the platform, reduce the average request waiting time and improve the response speed of the platform according to the concurrency.

Keywords: Big data · Human resources specialty · Distance training · Education platform

1 Introduction

Human resources are the core resources of enterprises, the degree of human resources development and use determines the strength of enterprise competitiveness [1]. But the university, has the human resources specialized, provides the specialized human resources talented person for the enterprise. Therefore, human resources training and education is particularly important. A sound and scientific human resources training education can better capture the market dynamics and development trajectory, so that human resources training is strategic, forward-looking, effective and targeted. Therefore, providing excellent human resources talents for enterprises has become one of the core topics of human resources professional research [2, 3]. The theoretical research on professional training of human resources in foreign countries has entered a comprehensive

and systematic development stage. Some scholars put forward the development, application and evaluation of training and the theory of “learning organization” according to the risk of education and training, and completely updated the training concept. The training and education contents shall focus on improving the learning motivation, perseverance and ability of the students majoring in human resources, realize the transformation from “stage training” to life-long training, and realize the transformation from “imparting knowledge and skills” to “improving learning ability”, so as to make the organization adapt to the market environment of development and change [4, 5]. In recent years, many human resources experts and scholars in China have made beneficial research and exploration on the theory of human resources training in Chinese enterprises by combining foreign training theories and practical experience with the actual situation of domestic enterprises. Some scholars point out that the training and education of human resources major should drive the formation and maintenance of core competencies of human resources major and accelerate the formation of core expertise and skills of human resources major students through the integration of human resources major [6, 7]. But in the above research, there are some problems, such as inconvenient use and high training cost. Therefore, a big data-based distance training platform for human resources is proposed. Based on the big data platform, the human resources professional distance training and education platform is divided into six modules, which are regulation management, human resources skill assessment management, online theory assessment management, training resource management, statistical analysis and training effect evaluation. The framework is client, application service, business service, application support, resource service, application support and training effect evaluation Data and support seven parts. The designed platform architecture enables the platform to connect users of different devices and locations through network communication protocol. It realizes that all users of the platform can be connected under any network, avoids space limitation, and solves the network problem when the number of network concurrent increases. Offline data collection and preprocessing, data cleaning, transmission to the database server, to achieve efficient human resources professional remote training.

2 Big Data Based Human Resources Professional Distance Training and Education Platform

2.1 Identify Platform Functional Modules

The design of professional distance training and education platform for human resources, in the overall framework of the platform design, taking into account big data platform features and timeliness [8]. Big data platform will be used as the technical support for the design of professional distance training and education platform for human resources professional distance training and education platform, provide good training environment and training resources.

Therefore, according to the needs of resources, management mode and training effect, the platform is divided into six modules: regulation management, human resource skill assessment management, online theory assessment management, training resource management, statistical analysis and training effect evaluation. Provide a good environment for human resources professional training and education, provide a good learning

environment for human resources professional students, and form a good communication environment between lecturers and employees, improve the closeness of lecturers and employees, and enhance the learning effect of human resources professional students. Therefore, the identified professional training and education platform for human resources functional modules, as shown in Fig. 1.

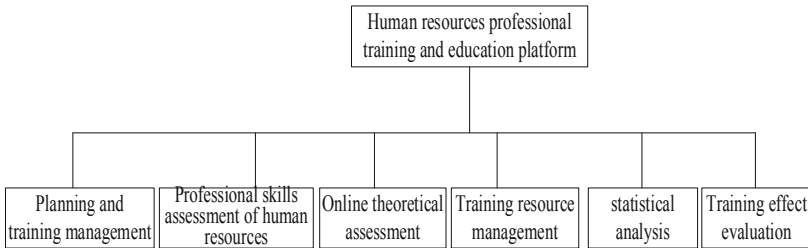


Fig. 1. Human resources professional training and education platform functional modules

From the function module of the platform, we can see that based on the six function modules, we can design the overall framework of the platform.

2.2 Design Platform Framework

The framework of the platform is divided into seven parts, namely, client, application service, business service, application support, resource service, data and support. The seven parts are independent of each other and support each other, and correspond to the functional modules determined in the platform.

The design of the client layer, that is, users use mobile phones, computers and other clients, to help users log in to confirm user identity. In the use of the process, by the training lecturer, choose the training content, determine the training method, through the training platform has the resources to complete the training of human resources students.

Specifically, the business online service providing layer, corresponding to the four functional modules of regulation management, human resources professional skills assessment management, online theoretical assessment management and statistical analysis, is the main management module of the platform; while the attendance information statistics included in the statistical analysis module needs to be counted through the application layer and identity identification function; the resource service layer corresponds to the training resource management functional module, management training lecturers and trainees, and all the professional training materials of human resources needed in the training process; the application support layer is the layer providing support for the business online service, such as examination practice and other examination contents, are stored in this layer; and the reflection evaluation at the application layer corresponds to the training effect evaluation, and is also the last step that the training lecturer needs to use in the use of the training distance training platform of human resources. Thus, the design of the human resources professional distance training platform, the design of the seven plates, each plate can be for human resources professional distance training and education work, provide good use of results.

However, the main frame of the platform is the support layer, which has the network communication protocol to maintain the operation of the platform. Once the network communication protocol collapses, it will directly cause the platform to stop running. Thus we can see the importance of the support layer in the distance training platform of human resources specialty.

Based on the design, as shown in Fig. 1, we need to deploy the platform communication network structure, collect professional information of human resources, establish platform database, so as to complete the design of the platform.

2.3 Deploy Platform Communication Network Structure

Based on the design of the platform, we can see that the platform's communication network framework is a vital part of the platform, which controls the platform's operation, link speed, human resources information interaction and other major functions. Therefore, based on the design of human resources professional distance training education platform framework, the network structure of the platform is divided into two parts: external network and internal network, and the platform content is received by the special router and processor of the university.

Because the platform framework designed in this paper enables the platform to connect users of different devices and locations through network communication protocols, the platform communication network structure deployed in this time can receive all network signals, and network communication network protocols edited by routers can convert network signals, and under any network, all users of the platform can be connected to avoid space restrictions. Moreover this kind of network deployment way, has avoided the platform user to increase effectively, creates the concurrent quantity to increase, produces the network carton question. Let the information on the platform to receive, transmission, more flexible, fast, stable and reliable.

Ethernet represents the Internet outside the human resources profession, through which the human resources professional distance training and education platform and the internal network need to be connected, and the signal is transmitted to the terminal, making full use of the high-speed, security, cost-effective advantages of the Internet itself. In the process of network use, it is also divided into three modules to meet the different levels of human resources training needs. Finally, the distributed network of professional distance training platform of human resources is formed, which makes the platform have certain expansibility, flexibility and compatibility.

The deployed platform communication network framework is divided into three layers: user access layer, functional application layer and data resource layer when it is applied to human resources professional distance training platform. Among them, the user access layer is the interface that connects with the outside world when the platform is running, such as the Internet, each client of the human resources profession, etc.; the function application layer is the main application layer of the platform, which needs to adopt the Web server, call the data in the database server, and pass the data through the server for processing, and finally pass the information to the users through the Web server. In addition, the user access layer can add new computers, increase the number of users' visits, improve the amount of bursts of the platform, increase the throughput of the application program, and avoid the Karton problem that may occur during the operation

of the platform; in the data resource layer, all the training and education materials and information of the human resources profession are included, and it is necessary to collect and process the training and education data of the human resources profession, establish the database, meet the needs of the distance training and education platform of the human resources profession and the training materials.

2.4 Processing of Training and Education Data Based on Big Data

Based on the communication network application platform architecture shown in Fig. 4, consider the wide range of human resources specialties and complex data types [9]. Therefore, the big data platform, in the data resources layer, the collection and processing of human resources professional training education data, the data collection and processing process, as shown in Fig. 2.

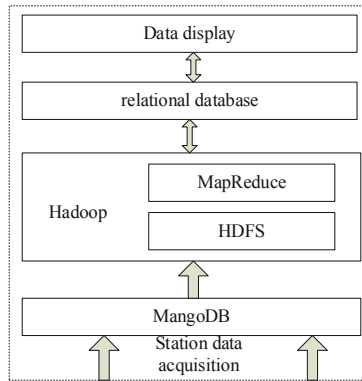


Fig. 2. Data acquisition and processing flow

As can be seen from Fig. 5, the big data platform used to collect human resources professional training and education data needs to collect from the human resources professional data side, and save the data to the big data platform of the Hadoop framework HDFS for subsequent processing and analysis. The big data processing framework carries on the preliminary statistical analysis operation to the collected data, and saves the operation result to the relational database to carry on the transaction operation and the statistical analysis.

In addition, there are some off-line data collection, data cleaning, data conversion will be saved to the big data platform Hadoop for subsequent processing and analysis.

We can find that there is a special data transmission structure in the data acquisition and processing process designed with big data platform, as shown in Fig. 3. Only when the collected and processed data are transferred according to the data transmission structure shown in Fig. 3, can the training and education data be transferred to the client for use by users.

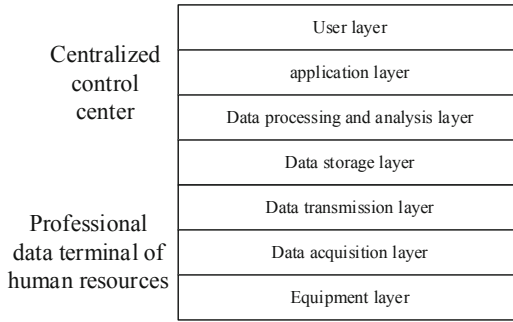


Fig. 3. Data transmission structure

2.5 Establishment of Platform Database

Combining the contents of Sects. 1.3 and 1.4, it is found that the database occupies a very important position in the platform. Therefore, based on the database functions identified in Fig. 1, the database framework identified in Fig. 2, the database network applications identified in Fig. 4, Layer 4, the platform database established for the primary purpose of database use, as shown in Fig. 4.

In Fig. 4, 1 can be represented as (1:1), a one-to-one relationship; 1 and n can be represented as (1 : n), a one-to-many relationship; and between m and n , ($m : n$), a many-to-many relationship [10].

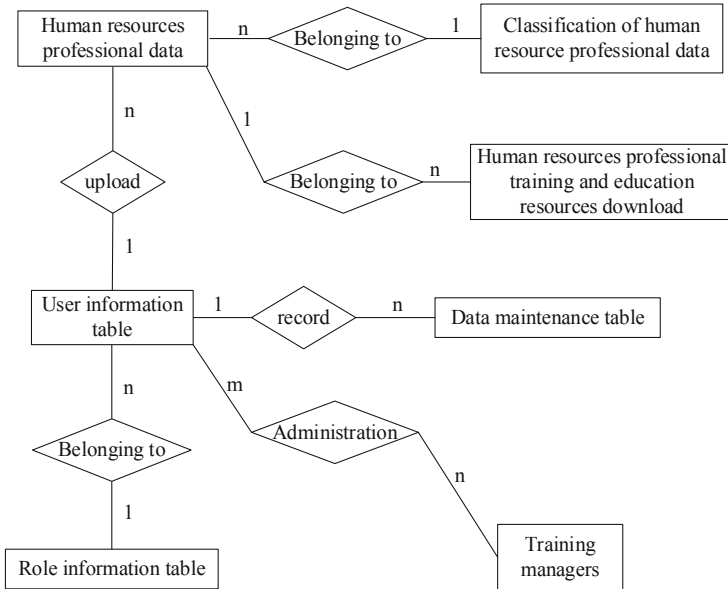


Fig. 4. Platform database E-R diagram

Based on the platform database E-R diagram shown in Fig. 4 and the database server identified as MySQL 5.7 server, the database will be managed using Microsoft SQL Server 2005 software. To this end, in the process of establishing the platform database, the size of the database is adjusted to an adjustable mode to facilitate the later addition of information and the expansion of the database; when the information in the database is used, it needs to be read out of the database and released immediately after it is used.

Therefore, the operation mode of the database is extracted separately, and the SQL-Help class structure is adopted to uniformly operate the database. The operation process is shown in Fig. 5.

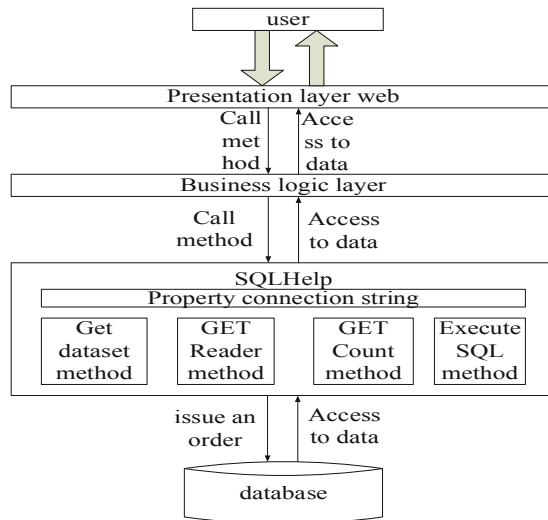


Fig. 5. Unified database operations

As can be seen from Fig. 5, the uniform operation procedure of the database designed this time is to, when a user performs certain operation, respond to the operation procedure of the user through the surface layer, judge whether the data manipulated by the user needs data processing, and if the data processing is needed, then call the method of the business logic layer, and pass in the data processing information, the sql operation parameters, the methods of SQLHelp classes such as Get DataSet, Get Reader, Get Count, SQL, etc., pass in the sql operation parameters, and determine the SQLHelp class operation methods needed by the user, process the data. After the data processing operation is finished, the data processing execution results will be returned to the logical structure layer, and then returned to the presentation layer by the logical structure layer, and finally returned to the user by the presentation layer, so as to complete the call of the data in the database.

3 Platform Testing

Verify the design of the human resources professional distance training education platform, using mobile client, using Windows 9 to operate the design of human resources professional distance training education platform. And the design of the human resources professional distance training and education platform, recorded as a platform, the two traditional human resources professional distance training and education platform, recorded as B platform and C platform. According to the operating characteristics of the platform, taking the operating effect of the platform as the experimental direction, the operating environment of the platform is determined, the concurrent volume of the system is changed, and the response time of the platform is compared with that of the three groups of platforms.

3.1 Experimental Preparation

The verification of human resources professional distance education platform, using the Windows 9 operating system, the required experimental test environment, as shown in Table 1.

Table 1. Experimental test environment

Serial number	Name	Parameters
1	Client operating software	Windows9
2	Processor memory	8G
3	RPC service governance	Dubbo
4	Hard disk processor	IT
5	Client CPU	Intel Core i5-3230m
6	Registration centre	Z00Keeper
7	Client memory	4G
8	Process CPU	Intel Core i5-5200u
9	Client hard disk	500 GB
10	Processor operating software	Linux (centOS6.7)
11	Processor database	MySQL 5.7

Based on the experimental test environment of HR professional distance training and education platform shown in Table 1, professional platform testers will test the platform during the test. In the process of testing, the main functions of the platform are as follows: (1) Testing the login interface of the platform to test the login speed, identity recognition and other functions; (2) Testing the link of the webpage to test the connection speed between the various sections of the webpage; (3) Testing the webpage to test that the webpage is connected through the buttons, and the correctness, sensitivity and explanation of each button position affect the overall use effect of the platform. Therefore,

the testing of the buttons occupies a major position in the use effect of the platform; (4) Checking the information entry interface, and the security and completeness of the information entry interface determines the training and inspection effect of the training system for human resources professional trainers. First, it avoids the information leakage of human resources professional trainers, and second, it avoids the evasion of training by human resources professional trainers. Therefore, when testing the human resources professional remote training and education platform, it is necessary to repeatedly check the information entry interface to determine the completeness of the information entry interface and the items that must be filled in; and (5) Checking interface of the webpage, which is the main embodiment of the platform for human resources professional remote training, therefore, it is necessary to carefully check the display effect of the interface, the effect of labeling, the typeface size, the.

From the aspects of training manual management, teaching activity management, evaluation management function, examination management function, examination paper management function, exercise management function, personnel information statistics function, achievement statistics, evaluation information statistics, attendance management statistics, teaching activity information statistics, etc., 5000 test cases of the platform for distance training and education of human resources specialty are designed, and the generated parallel quantities can be divided into five grades, such as 1, 50, 100, 500 and 1000, and can be used as the test objects of the experiment.

The human resources professional distance training platform test, choose Apache software AB test tools, test the three test platform, the test experiment, the use of testing tools, the instructions, as shown in Fig. 6.

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管理控制台: C:\Windows\System32\cmd.exe
[-n requests]      Number of requests to execute
[-c concurrency]  The number of requests made at one time
[-b window size]  Size of TCP send / receive buffer (bytes)
[-t timelimit]    Second to maximum is spent on basic tests
[-s timeout]     Seconds to the maximum waiting for each response, the
                 default is 30 seconds
[-B address]     How much troubleshooting information do you
                 want to print
[-v verbosity]   The address that is bound when an outgoing
                 connection is made
[-x attributes]  The string to insert as a table property
[-y attributes]  The string to insert as the TR attribute
[-C attribute]   Add any header row
[-H attribute]   Insert after heading row
[-V]            Print the version number and exit
  
```

Fig. 6. Instructions for using the AB test tool

At this time, we can design three groups of platform contrast experiments to test the actual use of three groups of platform. In the test process, select a city university human resources professional teachers and students, as the test object of the platform.

3.2 Results of the First Set of Experiments

Based on this experiment, the designed experimental environment and method, using the AB test tool in Apache software, test three groups of platforms, in the experimental test environment as shown in Table 1, test the parallel quantities of five grades, such as 1, 50, 100, 500 and 1000, compare the throughput rate, average request waiting time of users, average request waiting time of servers and number of request errors on the distance training and education platform for human resources professionals, the test results are as shown in Table 2.

Table 2. Test case test platform comparison results

Platform	Parallel quantities	Rate of throughput	Average user request waiting time	Average server request waiting time	Number of requests for errors
C Platform	1	30 bps/s	20 ms	20 ms	0
	50	756 bps/s	69 ms	6 ms	0
	100	917 bps/s	137 ms	3.48 ms	2
	500	198 bps/s	1986 ms	5.79 ms	1
	1000	296 bps/s	1978 ms	3.96 ms	1
B Platform	1	34.56 bps/s	20 ms	20 ms	0
	50	857 bps/s	87 ms	8.11 ms	1
	100	943 bps/s	167 ms	2.91 ms	2
	500	195 bps/s	1194 ms	5.85 ms	4
	1000	496 bps/s	2018 ms	4.87 ms	7
A Platform	1	50 bps/s	20 ms	20 ms	0
	50	1000 bps/s	50 ms	1 ms	0
	100	1030 bps/s	97 ms	0.97 ms	0
	500	488 bps/s	1023 ms	2.046 m/s	0
	1000	545 bps/s	1832 ms	1.832 m/s	0

As can be seen from Table 2, the platform C isism, and when there are age number of access users on the platform, the concurrent relatively large and the concurrency generated will small, and the average request waiting time of users, the average request waiting contrary; the platform B is only suitable for small parallelism, and when there number of access users, request errors will occur, which will affect the usnly the platform A, no matter how much the concurrency is increased, the number of request errors will always be 0, andoughput generated will be automatically adjusted according to the actual situation, so.

Therefore, the platform can support all the teachers and students to visit, and during the visit, it can automatically adjust the throughput, avoid the Karton phenomenon of

the platform, improve the operating efficiency of the server, reduce the waiting time of the users, and improve the overall use effect of the platform.

4 Closing Remarks

To sum up, this design of human resources professional distance training education platform, make full use of big data platform, data processing ability, design a simple, efficient, comprehensive resources of human resources professional distance training education platform. However, the design of distance training platform for human resources professionals did not consider the training and education, the need for data evaluation model for training human resources professionals, the performance of evaluation, and in terms of the security performance of the platform, has not been studied and described. Therefore, in the future research, there is still a need for in-depth study, human resources professional distance training platform, human resources professional trainers performance evaluation, platform privacy protect the efficiency of the use and management of the platform and encryption protection of sensitive information.

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References

1. Gong, H.: How to implement enterprise human resources standardization management in the new era. *Value Eng.* **39**(3), 81–82 (2020)
2. Xiang, J.: Analysis of the professional development of human resource managers in universities. *jiaoyu jiaoxue luntan* (37), 7–8 (2020)
3. Chen, X.: A research on situational teaching in dual-innovation courses for human resource management majors in vocational colleges. *J. Zhangzhou Tech. Inst.* **22**(2), 17–21 (2020)
4. Li, Z.: Research on human resources training and incentive mechanism of civil aviation flight attendants. *Value Eng.* **39**(11), 58–60 (2020)
5. Shi, T.: Construction of human resources training management system for logistics enterprises in big data era. *Logist. Technol.* **39**(5), 38–40 (2020)
6. Yang, Y.: Current situation and the optimal path of human resource training and development in provincial agricultural scientific research institutes. *J. Anhui Agric. Sci.* **48**(17), 253–255 (2020)
7. Liu, S., Bai, W., Zeng, N., et al.: A fast fractal based compression for MRI images. *IEEE Access* **7**, 62412–62420 (2019)
8. Sun, Y.: A study of the application of the center for teaching and learning development in logistics human resource training system in colleges and universities. *J. Zhejiang Bus. Technol. Inst.* **18**(2), 74–76 (2019)
9. Li, Z.: Hierarchical storage simulation of public resources big data in cloud storage environment. *Comput. Simul.* **36**(10), 383–386,404 (2019)
10. Jiang, R.: Design and implementation of human resource system based on C#. *Comput. Knowl. Technol.* **16**(2), 51–53 (2020)

11. Liu, S., Li, Z., Zhang, Y., et al.: Introduction of key problems in long-distance learning and training. *Mob. Netw. Appl.* **24**(1), 1–4 (2019)
12. Vincenti, G., Bucciero, A., Helfert, M., Glowatz, M. (eds.): *e-Learning, e-Education, and Online Training*. LNICSSITE, vol. 180. Springer, Cham (2017). <https://doi.org/10.1007/978-3-319-49625-2>
13. Xiao, M.: Research on higher vocational teacher training system from the perspective of human resource management theory. *J. Chang. Telecommun. Technol. Vocat. Coll.* **19**(3), 62–65 (2020)