Key Technologies of the Construction of Knowledge Resources Service Cloud Platform in Financial Institutions

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\textbf{Abstract.} Knowledge resources service cloud platform of financial institutions can provide professional financial knowledge service model to promote the cultivation of financial talents, data decision-making, and financial business innovation. This paper analyzes the integration of financial knowledge resource, the intellectuality of knowledge management and the professionalization of knowledge service. Cloud computing, semantic network and other key technologies were used to realize the intelligent management, integration and professional service model of financial knowledge resources which are belong to multi-source heterogeneous resources. Financial institutions’ knowledge resource service platform were constructed under the guidance of the analysis’ result. It consists of four levels, basic support layer, knowledge resource layer, knowledge service layer, and user layer.

\textbf{Introduction}

Traditional financial is transforming to the IT (information technology) support financial. Financial industry belongs to the knowledge intensive industry. So, the ability to develop and innovate financial knowledge and effectively use of financial knowledge are the vital factor in the competition of financial talents. The following problems need to be solved as soon as possible in the increasingly complex market environment with massive information resources, like how to construct the knowledge resources database, meet the need of information technology instruction, and create a new environment to cultivate financial personnel with high quality in financial institutions.

In recent years, the research of the construction of financial digital resources database is gaining more and more attention. Ruili Dong and Junru Qiu analyzed the construction methodology, content and anticipate result of instructional resource database and put forward the ideas that the opening and service function should be paid attention to during the construction process.\cite{1} Hui Miao and Haishen Li explained the structure of instructional resource database for financial experiment instruction.\cite{2} Guomin Zhang designed an network learning platform which can support autonomous learning.\cite{3} Yan Tao, Jiang Wei and Tian Wang analyzed the transformation characteristics of knowledge and the acquisition and diffusion process of knowledge in all phases of the innovation of financial service, and stated that effective knowledge management in financial service industry could greatly improve the innovation of service.\cite{4}

The experiences from the above researches provided examples to the construction of instructional resource database in financial instruction. Financial education is market orientation and has very close relationship with financial industry. So the construction of resources platform needs more systematic and profound research, to highlight the characteristic of financial industry and to meet the requirement of personnel in enterprise and financial education, and adapt to the current technology development trend. The function of resources platform should be designed according to the characteristics of financial knowledge management in order to enhance the adaptability of resources.
The Characteristics of Financial Instructional Resources

The Integration of Knowledge

Under the background of financial reformation, financial models need constantly innovation. Financial personnel often need to query information in the perspective of the business process chain in different kinds of financial models. They will afraid to lend if they don’t understand more about the industrial chains, science laws, and the intellectual property rights. This dilemma reveals the importance of the cultivation of compound talents. So the financial knowledge resources platform requires adequate knowledge as reservation. The sources of resources come from a variety of ways: professional databases, global statistical data analysis database, situation analysis report and financial research data; simulation systems, such as finance software, settlement simulation system, credit and risk management simulation system; teaching resource database, such as chart database, voucher database, case database, product database; talent database; online materials, such as websites, blogs, Wikipedia, Encyclopedias, etc.

Intellectuality of Knowledge Management

The resources platform with massive resources is a valuable treasure. Since the resources come from heterogeneous systems, the structures of some data are semi-structured or unstructured and disorganized. Some of the resources repeat in storage. Data processing logic are too simple for the extraction of knowledge. The intelligent management of knowledge becomes more and more important.

The Specialization of Financial Knowledge Service

The financial knowledge resources platform has the dual service function for both enterprise and service teaching. So, it should provide professional and accurate knowledge service.

The Function of Financial Knowledge Resources Platform

The first function is online, open and massive. The platform could access to knowledge database systems and knowledge service applications.

The second function is the intelligent management of resources. It should be able to collect, select, refine, integrate, evaluate, and reconstruct the dispersed knowledge of finance major, and construct the knowledge resource system with the ability of knowledge service. It also should provide intelligent search tools to quickly grasp the needed information from the massive information, and help users to solve the problem initatively.

The third function is the platform should include professional knowledge service products, provide professional information service mode, like forming financial knowledge map, customizing financial services, and analyzing financial data, etc.

The Difficulties and the Technical Suggestions of the Construction of Financial Knowledge Resources Cloud Platform

The financial knowledge resource service cloud platform can aggregate professional resources of finance major, mine the relationship between knowledge, effectively manage the highly specialized knowledge, co-construct knowledge, and share knowledge. It serves as the autonomous learning platform for university teachers, students and financial enterprise personnel, and also serves as the in-service training platform for financial enterprise personnel.

There are several difficulties in the construction of knowledge resources service cloud platform, like how to form the effective mechanism for the management of resource, how to excavate the valuable knowledge of professional financial databases, how to predict the search intention of user, and how to provide effective and personalized service, etc.

Two kind of integration should be used in order to solve the above difficulties. The first one is the integration of multi-source heterogeneous systems. Resources are stored in heterogeneous systems...
which belong to various organizations. The integrated resources could provide unified access to distributed multi-source information resources. The second one is the integration of heterogeneous data. Then, the resource platform should be able to meet the sharing of all kinds of systems during the process of instruction, such as teaching systems, resource systems, management systems, evaluation systems, interaction and cooperation systems, and so on.

Cloud Platform which Integrate Multi-source Heterogeneous Systems

Cloud computing technology is becoming more and more mature. It is a good solution for the integration of multi-source heterogeneous systems. The essence of cloud computing is to connect various resources through the Internet. It has super-powerful compute ability and can access different platform. So it can integrate data, computing power, storage resources and other resources into a pool of resources which can allocate resources dynamically according the requirement of user. PaaS (Platform-as-a-Service) model could be constructed to promote the deep innovation of knowledge resource service model under the help of cloud computing technology.

In the design of knowledge resources platform data center, cloud computing technology were used to integrate hardware and software resources. Servers and storage devices were integrated into the virtual resource pool by virtualization software. Cloud platform management software were deployed to allocate resource on demand and develop flexible architecture. There are many mature cloud computing management software in the companies like IBM, HP, HUAWE, and so on. Figure 1 is the architecture chart of cloud platform data center which was constructed by VMware and HP cloud platform management software.

![Figure 1. The Architecture of Cloud Platform Data Center.](image)

Using Semantic Web Technology to Set up the Intelligent Management of Financial Knowledge Resources

Ontology based semantic web technology is a hot topic in the research on knowledge service in recent years. Its core idea is to use machine instead of human brain to form the semantic network with the ability of intelligent computing via adding semantic metadata that can be understood by a computer to web documents, and using ontology language to describe words relationship, concepts relationship and logic relationship. Ontology defines the basic terms and the relations of the vocabulary which relate to subject fields, provides a common understanding of the domain knowledge. Computers exchange information in different fields and communicate through the understanding to ontology, to realize knowledge sharing and reuse.

Data from different business system in financial knowledge resources platform couldn’t be shared because their description different from each other. The following methods could partly solve this problem. To construct the ontology database of finance major by means of semantic web
technology based on ontology. Then, to organize, mine, evaluate and reconstruct knowledge according to the knowledge management mechanism. Finally, to construct the knowledge resources system with professional knowledge service capability and realize intelligent knowledge resources management. The process was shown in figure 2. It can be divided into the following three steps.

The first step is to construct the domain ontology of financial knowledge resources. To organize financial experts, sort out the professional concept, and form standard formal representation.

The second step is to construct ontology database. Semantic description language was used to describe the data resource objects according to the concept and relationship of domain ontology. Data resource objects with semantic mapping were formed after the concept analysis, classification, index, description, and process of knowledge resources object, and were stored in the ontology database according to the prescribed format.

The third step is user requirement matching. As soon as the users put forward the demand of knowledge, the platform could extract the information like task description, attribute classification, and generate the structural expression based on ontology as the retrieval conditions according to the semantic analysis of financial domain ontology. Then, the knowledge in ontology database that matches the search conditions were extracted according to user’s search condition and the ontology concepts mapping. The related knowledge resources were found out and filter matched according to the index system. Finally, the search results were pushed to user.

The Design of Professional Service Model which could Provide Efficient Resource Services

The platform should provide not only general knowledge query service, but also data mining and process customization based on the knowledge resource database in order to meet the specific requirements of resources service in financial major. Then, the following professional information service mode should be constructed.

The first service mode is financial knowledge map. Financial knowledge map presents the professional knowledge distribution, knowledge hotspots, and knowledge association in visualization way through the semantic sorting and semantic clustering to knowledge resources.
database, and provides knowledge navigation tools, such as knowledge association maps, expert maps, and so on.

The second service mode is financial product customization. The knowledge which can be standardized and solidified in a process, like experience, methods and the procedures were packaged into the knowledge service component with independent function through the sorting of the typical financial business processes.

The third service mode is financial data decision support. With the support of data mining technology, the function of data trend analysis was provided to support user decision.

The Architecture of the Knowledge Resources Service Platform in Financial University Based on Cloud Computing

This paper proposes the architecture of knowledge resources service cloud platform in financial university according to the requirements of knowledge service in university and financial industry. Based on the application of the next generation Internet technology like cloud computing and semantic web, the structure of platform can be divided into four levels, infrastructure layer, knowledge resource layer, knowledge service layer, and user layer.

![Figure 3. The Architecture of Knowledge Resources Service Platform in Financial University.](image)

The first layer is infrastructure layer which is the base layer of the cloud platform. It integrates all kinds of hardware infrastructure into the resources pool through virtualization technology, such as servers, storage, safety equipment. Cloud scheduling could be applied to all resources. It is the support environment with high performance which can make flexible adjustment according to the scale of users and services.

The second layer is knowledge resource layer which is the main layer of cloud platform. It is the layer to access resource, integrate massive multi-source knowledge systems, and aggregate them into the cloud service platform via cloud agent service. Then, the ontology database was constructed based on the construction of the semantic relation of resources according to resource description method. Index database was developed based on the construction of the index nodes of resources from different system according to the distributed index. Knowledge management mechanism and intelligent search engine were integrated into the index database, ontology database, and the relation knowledge database to realize the unified organization of knowledge resources in platform.

The third layer is knowledge service layer which is the application layer of cloud platform. It is
the portal of knowledge resource platform which was constructed based on the demand analysis and large scale data mining. According to user’s knowledge requirements, it provides professional knowledge service applications like knowledge search service, expert inquiry, knowledge push, knowledge subscription, knowledge map, financial business customization, financial data analysis, etc.

The fourth layer is user layer which is mainly serves as the knowledge application for teachers and students in university and financial personnel. They can access the resource service platform portal and all kinds of knowledge resources and services via different terminal equipment in any place with Internet access.

**Conclusion**

Financial knowledge resource service platform provides professional knowledge services for teaching guidance, scientific research team construction, professional knowledge consulting, personal learning assistance, etc. The research of this paper is still in the stage of theoretical research and system development. It needs further research in the sharing model and service mode of knowledge resources and knowledge service professional product design.

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