Construction of Construction Engineering Cost Cloud Service Platform and Its Application

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Construction of Construction Engineering Cost Cloud Service Platform and Its Application

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Abstract: With the continuous development of industrial informationization, engineering cost informationization has become more and more important. However, as the amount of engineering cost information increases and changes constantly, engineering cost information faces great challenges. In this paper, we firstly analyze the advantages of cloud computing in the field of engineering costing, and then combine cost information with cloud computing technology to build a cloud service platform for engineering cost information services. The construction of the project cost cloud service platform can not only lead the development trend of the industry information service, to effectively meet the extensive needs of enterprises for building materials and materials, but also greatly reduces the cost of intermediate links and the asymmetry of information, so that the losses incurred are conducive to promoting fair and open market competition.

1. Introduction

In recent years, the continuous expansion of China's infrastructure construction and investment in social fixed assets investment has driven the rapid development of China's construction industry. In the informationization of construction industry, cost informationization is the most popular application. As the project cost moves from a planned economy to a market economy, the price information of materials has become an indispensable part of the construction economy and cost control. However, the buyer cannot grasp the price information of the supplier in time, and the price provided by the supplier may change at any time due to the fluctuation of the price of the raw material, and the price offered by the supplier in different regions may also be different. Therefore, buyers need to spend more time deciding on suppliers of different materials. In order to accurately grasp the construction market dynamics and predict the development trend of engineering cost, material buyers need to spend a lot of time in the construction field to deal with these cost information, so that the project budget is at a minimum.

At the same time, with the rapid growth of Internet data, the concept of cloud computing has gradually become a hot field. Cloud computing has become a driving force for e-commerce to continue to develop with large-scale data computing and storage capabilities, and has become an important platform for providing a variety of Internet services. Therefore, it is very necessary to combine cost information with cloud computing technology to build a cloud service platform for engineering cost information services. Through this platform, material buyers can obtain supplier material price information in the first time, and quickly contact suppliers, so greatly reduce purchase time. For suppliers, fair and free market competition can eliminate high-priced and low-quality producers, so that good quality suppliers can stand out from competitors of various brands in the same industry and gain more market share.

2. The advantages of cloud computing in the field of engineering costing

At present, there are still many problems in the field of engineering costing, Information lag, low information sharing, insufficient value mining, etc. Cloud service platform is an important part of industry informationization. Cloud computing is an important information technology tool and will play an important role in the future process of engineering cost informationization. Combined with the practical experience of engineering costing, here we analyze the main advantages of cloud computing technology in this field.

(1) Improve data processing capabilities

Information mining is the future direction of development, which needs to be based on a large amount of data information. The type of project cost information is complex, with graphics, data, tables, text, etc., its information update speed is also very fast. In order to acquire knowledge rules from massive data and establish correlative relations among factors, computer technology is highly demanded. Cloud computing has distributed storage and computing technology for massive data, which disperses tasks on multiple nodes and processes them separately and then aggregates them to speed up data processing. The data storage technology of GFS or HDFS adopted by various IT vendors meets the needs of distributed storage in cloud computing, while ensuring data reliability, high throughput and high transmission rate.

(2) Centralized resource sharing

Applications often have complementary characteristics in resource usage patterns, and different applications have different access peak periods. Cloud computing can provide resource utilization through resource sharing, and one unit resource can meet the resource allocation needs of multiple applications. Resource centralization is the premise of sharing, so cloud computing uses virtualization technology to centralize the decentralized infrastructure to form a resource pool, and then through load balancing technology, assign task balancing to multiple operating units to execute, so as to achieve resource peak-shaving and valley-filling, reduce resource input and use costs. The comparison of resource usage models between traditional IT and cloud computing is shown in Figure 1.

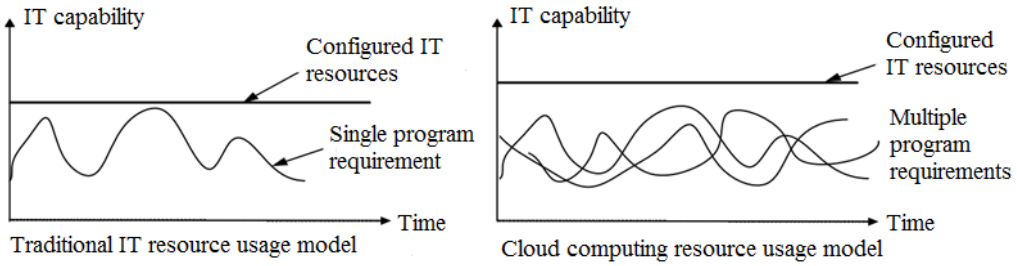

Figure 1. Comparison of resource usage models between traditional IT and cloud computing

(3) Resource allocation on demand

Traditional network services are like individual power plants. Every enterprise or organization needs to purchase its own power generation equipment to generate electricity. While cloud computing, like professional large power plants, frees users from infrastructure investment. The cloud computing service provider purchases the infrastructure to form a large resource pool, and the user uniformly obtains the required services from the large resource pool and pays according to the usage, and the maintenance and management of the infrastructure is the responsibility of the provider.

(4) Flexible expansion

In such centralized supply mode, the amount of service users can get is not fixed. Users can choose to expand at peak times and unsubscribe from some services during the down period. The number of infrastructure can also be extended through key technologies such as cluster management technology and virtual machine replication. At present, companies such as IBM and Amazon are increasing the number of servers for cloud computing.

(5) Mobile application service

Cloud computing relies on the Internet to provide related services. No matter the database, software application or computing storage capacity is distributed on the cloud server, for the user, as long as there

is the Internet, they can get the service directly through the web browser on the mobile phone, tablet, PC and other devices. User's data information is updated in real time, regardless of when and where it is obtained, the service content is forever the latest.

3. Construction of engineering cost cloud service platform

3.1. Requirement analysis

According to the existing problems of project cost information management, we have made it clear that the cloud service platform of project cost should meet the following requirements:

1) Construct a new project cost information management platform for project cost management organizations, to understand the problems and other demands of cost workers in practical work, and provide more targeted guidance for the development of the industry.

2) Provide a more professional and authoritative platform for the exchange and sharing of engineering cost information, open a new mode of information exchange, and encourage all cost personnel and other stakeholders to contribute actively to personal accumulation and acquire more comprehensive and in-depth new knowledge.

3) Activate historical information, obtain more cost information of completed projects, tap potential knowledge, accumulate experience and lessons, and guide new projects.

4) Improve work efficiency, speed up information updating, and meet the needs of cost workers for information timeliness and reliability.

5) Promote industry innovation, by providing an open and simple application development platform for scholars who study the application of industry information forecasting and integration, and helping to realize the transition from theory to practice.

6) Breaking the barriers between region, specialty and organization, so users can dynamically and access information services nationwide.

7) Users are liberated from the computer hardware and software facilities. They do not need to pay attention to the operation and maintenance of the background, but concentrate more on the creation of professional knowledge.

3.2. Overall architecture

Architecture refers to how to best decompose a system into different parts, as well as the static structural relationship and dynamic interaction relationship among the components of the system. Most mainstream cloud computing architectures adopt a layered design approach. Therefore, this paper also uses the layered architecture model to design the architecture system of the engineering cost information management cloud platform.

Based on the general architecture of cloud computing and the specific application of the engineering cost industry, we divide the project cost cloud service platform into three levels: data resource layer, service layer, application layer. The lower service supports the upper service, and each layer can provide services separately. This architecture reflects the business logic of the platform. The overall architecture of the project cost cloud service platform is shown in Figure 2.

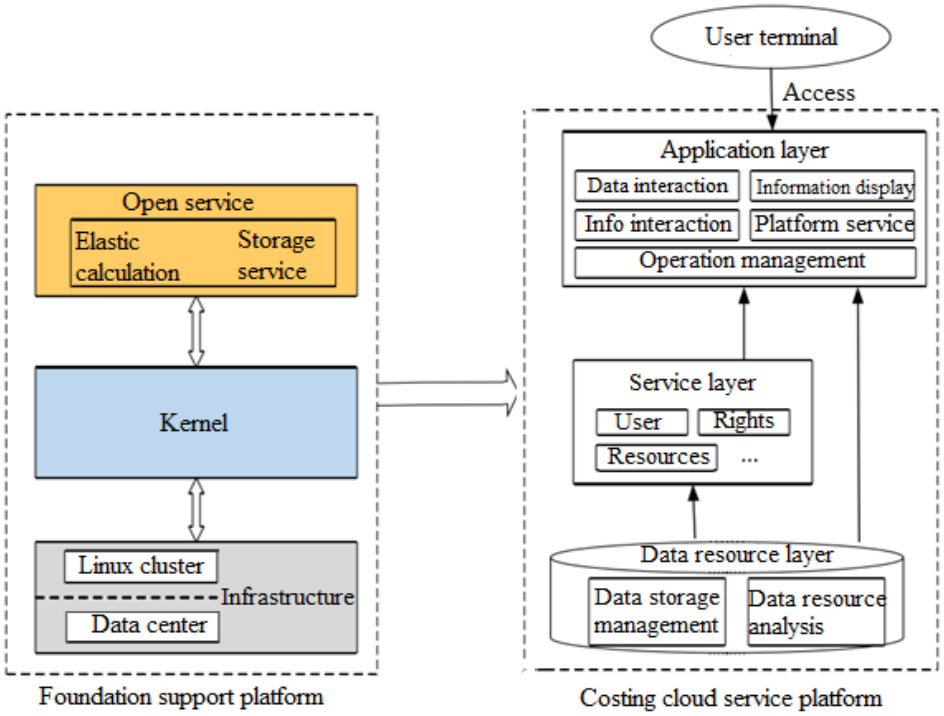

Figure 2. Overall architecture of the project cost cloud service platform

(1) Data resource layer

The data resource layer is located at the bottom of the entire cloud platform system, which plays a basic supporting role for the platform, and is responsible for responding to the access commands issued by the upper layer. The project cost cloud service platform is built on an open platform provided by the cloud service provider. Therefore, the data resource layer here is not a cluster of servers, networks, etc. integrated with the physical infrastructure, but a virtual resource infrastructure leased from the cloud service provider. In other words, it is a specific application of the IaaS service form.

This layer contains two basic functional parts: data resource storage and data resource processing. Data resource storage module stores structured and unstructured data information transmitted from the upper layer by the function of database system. At the same time, it schedules the information in the database for the upper service instructions at any time. Data resource processing module is the operation core of the platform. It uses the basic services provided by cloud service providers to respond to the service instructions of the upper level and to analyze and process large-scale complex data in the database.

(2) Management service layer

The management service layer is the core layer and management middleware of the cloud platform, which has the function of uploading and downloading. Service layer is mainly responsible for task management, resource management, user management and security management. Task management is a response to the application layer, which execute service requests issued by users in the application layer, and arrange the operation of deployment in the data resource layer. The goal of resource management is to optimize the allocation of resources and to schedule the lower resources according to users' business needs. User management is responsible for user registration, change, information management, privilege management and so on. It is the basis of customizing personalized service and access platform for users. Safety management should manage the operation of monitoring system and be responsible for the safe and stable operation of the whole platform system.

(3) Application layer

Application layer is located at the top level of the cloud service platform of engineering cost, which is directly oriented to users. In the application layer, the data management, information service and other functional modules of the platform are encapsulated to provide a unified interface for users to access.

Users access the application layer through the Internet. The service requests issued by the layer will be responded by the management service layer and executed by the data resource layer. The execution results will be displayed to users through the application layer.

The cost cloud platform in this paper integrates decentralized physical infrastructure into centralized resource pools such as virtual computing, storage, servers and so on. Flexible cloud computing services obtain infrastructure services from cloud resource pool to support the operation of data resource layer, and then directly develop and test cloud platform on the open PaaS service platform, namely cloud service search engine, and deploy the platform in the form of SaaS in the cloud. Users can access the platform directly in the browser without installing and downloading. In addition, the whole platform will also rent PaaS interface to provide external services, providing users with open platform services. During the development and operation of the cost cloud platform, the storage resource pool will provide structured, unstructured and massive data storage and computing services.

3.3. Platform functions design

On the basis of demand analysis, combined with the daily information needs of engineering cost work, the function of the project cost cloud service platform is divided into five modules: Data interaction, information display, information interaction, platform service and operation management. The functional structure design is shown in Figure 3.

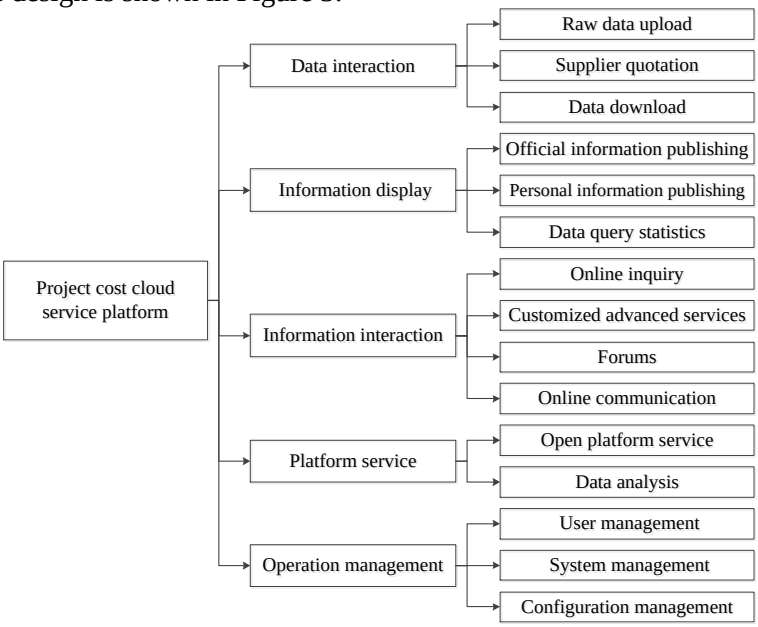

Figure 3. Functional structure design of project cost cloud service platform

(1) Data interaction

The data interaction module is an important data collection channel of the platform, mainly including three functions: user raw data upload, supplier quotation, and data download. Data upload is the basic function set for ordinary engineering cost related personnel. The user can upload the accumulated engineering cost information to the system according to the standard format, and then the background server automatically sorts the obtained information according to the attributes and stores it in the database for further use. User uploading information is a channel for the management platform to collect scattered market information in a large scale and at multiple levels. Only the quantity and content are guaranteed, and the value of the obtained data could be higher. Therefore, there is no excessive restriction on the content and form of the data uploaded by the user.

The survey data shows that simply relying on the cost station to provide some supplier material quotation does not truly reflect the material market price, so the platform has designed the supplier quotation function. After the supplier logs into the system, just fill in the attributes and prices of

materials according to the standard form provided by the system, and then upload the quotation can be completed.

Data download is restricted by authority. The system will judge whether it can download the content according to the user's identity. This function unit only provides some basic information download services, such as market price, initial information of completed projects, basic policies and regulations, etc. More in-depth and more valuable information needs to be obtained in the two modules of information service and customized service.

(2) Information display

Information display is the main function module of the platform for publishing information to the outside world, providing official information publishing, personal information publishing and information inquiry statistical functions.

Only local government engineering cost management departments have the right to publish official information, while other types of users can only consult but cannot modify it. There are two main types of information released: one is the information obtained from the data analysis function, the other is the official authoritative information released by the cost management department, such as information guidance price, quota revision information, the latest norms, etc. Cost management departments can also take the initiative to collect some solutions to engineering disputes, disputes and other issues to publish for reference.

Personal information publishing mainly provides company publicity, recruitment information publishing, help-seeking and other personal information publishing functions, or share some learning materials. Query statistics is the basic function of the platform. Users can query the information stored in the database according to their privileges through this interface. They can also use the tools on the platform to make statistical analysis of the acquired data.

(3) Information interaction

Information interaction module includes four functions: online inquiry, customized advanced services, forums and online communication, providing targeted communication and interaction between different users.

Online inquiry are intended to extend existing price dispute resolution. When some materials can not be found in the system, online inquiry service can be used. Users send requests to the system, fill in inquiry forms, and then professional information gatherers are responsible for replying. Of course, other users can also participate in replying to inquiries.

The main clients of customized high-level services are cost managers of construction units who are not professional enough. Users can upload the feature information of the proposed project to the cloud service platform, and request the backstage professionals to complete more complete and specific services such as project calculation, settlement analysis and post-project evaluation. This type of service cycle is relatively long, but more targeted.

Forum is an important way for modern engineering cost workers to exchange information, so the forum module is set up in the cost cloud platform. The forum has the general functions of posting and replying, and provides a more professional and free platform for the exchange and interaction of engineering cost related workers.

The online communication module has built-in web-based dialogue tool, which provides a platform for direct communication between material suppliers and other types of users. Both cost workers and enterprise purchasers can use dialogue tools to communicate directly with material suppliers and consult material matters, so as to improve communication efficiency.

(4) Platform service

Platform service module is mainly to encourage industry innovation and provide a platform for cost professionals and computer programmers to interact.

Open platform services are based on the advantages of cloud computing. On the one hand, they provide an open interface for online application development and encourage professional and creative users to develop small applications on the platform, such as price forecasting tools. On the other hand, in the platform, some online professional software and analysis tools are arranged in the form of SaaS.

The engineering cost software development company can arrange its own software and applications on this platform, to provide online application services and expand the market.

(5) Operation management

The operation management module consists of three parts: user management, system management, and configuration management. The object of this function module is the platform manager. User management mainly includes user registration audit, permission setting, behaviour monitoring, etc., and the user's access rights are updated according to the user's increase or unsubscribe behaviour. System management includes cloud platform monitoring, environment configuration, system log, etc. It is a function module for management personnel to maintain system operation. The configuration management is to optimize the network resources and service resources of the platform to ensure efficient and orderly operation of the platform.

4. Conclusion

This paper first thoroughly investigates the requirements of the project cost field, and then we use cloud computing technology to build a cost cloud service platform, to design the overall architecture and functional structure of the platform.

The construction of the project cost cloud service platform can not only lead the development trend of the industry information service, to effectively meet the extensive needs of enterprises for building materials and materials, but also greatly reduces the cost of intermediate links and the asymmetry of information, so that the losses incurred are conducive to promoting fair and open market competition. In summary, cloud computing technology not only provides new development ideas for the information management of the cost industry, but also provides an important opportunity for the application of cloud computing in the engineering cost industry. This is a win-win model. Facing the changes of the times, we believe that cloud computing technology will have a profound impact on the cost industry and engineering cost-related enterprises, and will be able to better create a better information management model for each project cost-related enterprises, and eventually achieve the goal of information management in the whole process of safe, stable and efficient engineering costing.

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