

The Study of Qujing's Educational Resources Sharing Mode and Application Strategy under Cloud Computing

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Abstract—With the education informationization putting into effect in Qujing City, the contradiction between energy supply and demand of education resource sharing has become increasingly prominent. After explaining the characteristics of cloud computing, this paper analyzes the current situation and the existing problems of Qujing's education resource sharing, discusses the practical basis of constructing the sharing mode based on cloud computing, and provides the mixed sharing mode that centralizes and simultaneously decentralizes Qujing's education resource sharing. Finally, it expounds the relative application strategies based on this mode.

Keywords—component; Cloud Computing; Education resource sharing; Co-construction and sharing; Application strategy

I. INTRODUCTION

In recent years, with the application and popularization of the new information technology that is represented by cloud computing, internet of things, the new generation of network application and communication technology, the network information service and resource sharing have been everywhere and various kinds of mini-micro intelligent devices are emerging. So to speak, people are in a society which is surrounded by information and all people are studying together. In March this year, the ministry of education issued the ten-year development plan of educational informationization (2011-2020). It emphasizes the construction of educational resource centers, and the realization of education resource sharing. However, from the actual situation of Qujing city, some phenomena exists commonly, such as low-level redundant development of educational resources, dispersed storage of digital educational resources, and no interoperability [1] of these systems. While enjoying the convenience brought by new technology, people notice some problems, such as the increasing demand of educational resources, the mass data, the complexity of resource heterogeneous distribution and operation [2]. The purpose of cloud computing is to provide clients with various kinds of resource sharing services. It is the most appropriate way to realize the education resource sharing in Qujing city.

II. THE CLOUD COMPUTING TECHNOLOGY AND ITS CHARACTERISTICS

Cloud computing is a new kind of computing mode. It is the comprehensive development of parallel processing, distributed processing and grid computing technology, or it is the commercial implementation of these computer science concepts [3]. As to the operation mode, cloud computing uses internet to shift process and calculation of data from personal computers or servers to the computer group on the internet. These computers are ordinary ones but controlled by a large data processing center. They allocate resource according to clients' demands, and achieve the same result as a super computer [4]. Generally speaking, cloud computing is cloud service. In accordance with the service mode, it can be divided into IaaS (Infrastructure as a Service), SaaS (Software as a Service) and PaaS (Platform as a Service). From the perspective of clients, the resources provided by "cloud" are of infinite extent, can be obtained at any time and be used as required. And they pay when use [5] it of course. In summary, the characteristics of cloud computing are as follows: it has low requirements of clouding service using devices; the cost is inexpensive; it provides the clients with the on-demand services, and shares the software, hardware resources, platform and data, reducing the waste of vacancy.

III. THE CURRENT SITUATION AND ANALYSIS ON THE EXISTING PROBLEMS OF EDUCATION RESOURCE SHARING

A. The current situation of education resource sharing

Although the education informatization project in Qujing has gained some achievements, education resource sharing has not been fully applied. The construction models of education resource sharing are not unified. In general, it is still in the stage of development. At present, the Qujing city and the governed districts have established their own educational resources centers. But these centers are separate without any association. Basically, the centers at all level construct the centers by purchasing, not exploiting. The participation degree of the teachers in the schools is low. The centers formed in this way are merely vanity projects with little value. The current education resource sharing mode in Qujing is shown in Figure 1.

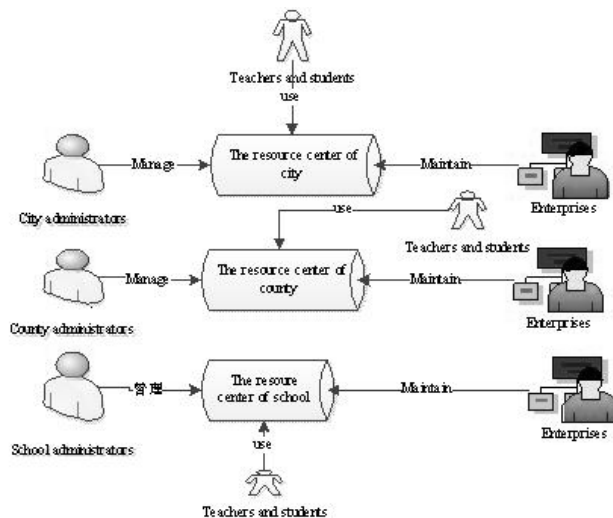


Figure 1. the current education resource sharing mode in Qujing

The government supports the economically backward regions to construct education informationization. But the typical primary and secondary schools that the author investigates pay much more attention to the construction than to the application. The infrastructure construction of these schools is relatively better, but few of them are effective. Therefore, these educational resources are isolated, forming several “information islands”. The education resource sharing is the core of the education informationization. Providing education resources cannot be shared, education informationization is out of the question. Thus, it is essential to solve the present problems.

B. The analysis on the existing problems

1) Educational resources cannot satisfy the demands of teachers and students.

From the sharing mode in Figure 1, we know that teachers and students can obtain the educational resources from educational resource centers at all levels. But these resources are constructed by the third party. They cannot satisfy the demands of teachers and students. It is inconvenient for teachers and students to access to different centers in different webs. Nowadays, with the development of educational informationization, the requirements of educational resources are increasing. How to ensure the effective sharing and ease the contradiction between supply and demand has become the bottleneck of the development. Obviously, the current resource sharing mode has not solved this problem in Qujing. In order to improve the effective use of educational resources and meet the need of teachers, students and other clients, educational resources must find a new way out, which is the inevitable tendency of information society.

2) Educational resources are repeatedly constructed and seriously wasted.

From the Figure 1, we can see that, the resources centers of the city, counties or schools are built independently.

Without any connection, these centers do not consider whether others have had the similar resources when establishing a center. The phenomenon of repeated construction is serious. The purchased resources are poor in universality. The implementation technology of resources is inconsistent. Without unified standards and principles and using interfaces, resources systems are not interoperable. It is impossible for them to form a unified platform. It is hard to share and inconvenient to use [7, 8], thus these resource systems are “information islands”. Most of the purchased resources are compensable services. Merchants may merely authorize limited users, so the resources are unavailable for full use. But we shall protect the developers’ legal rights, so these two aspects are related but contradictory [7]. On the other hand, some teachers have plenty of quality resources in schools and some of them are able to exploit the resources that are adaptable to local education. However, they cannot realize the sharing because of technology and policy.

3) The management mechanism is unscientific.

When it comes to construction, although education departments and schools at all levels have established the education resource centers, but it is unscientific in management. When consumers use the education resources, their comments cannot be fed back to developers. Thus developers cannot modify the resources according to the practical application based on their comments. If the syllabus and teaching material change in the processing of using, it is necessary to adjust the relevant resources. But the users and developers are disjointed in the current resource sharing mode. Therefore, the resource updating cannot be done timely [6]. This kind of management lacks guidance, encouragement, supervision and norms of policies. Each resource center establishes its own system. They are relatively independent, spontaneous and unordered [7]. Apparently, the management mechanism is profoundly unscientific. It is hurtful for resource sharing to develop healthily. The managers of all education departments are unaware of the practical situation and introduce the centers blindly. When establishing the educational centers, they do not investigate and survey the information technology and level of users, but refer to other construction situation in developed areas, and copy mechanically. When generating strategies, they do not adjust measures to local conditions. When the center construction is accomplished, they do not take proper measures to arouse users’ enthusiasm. A large number of teachers and students use it passively, and even some of them do not know how to use it. The center with high cost cannot play its due role. It is essential to make relevant rules and regulations. When we decide to construct the resource centers, we make sure they would be applied to practical teaching works.

4) The application strategy is not standardized.

The purpose of constructing educational resource centers is to put them into use, and teachers in different areas can mutually share them. For society, it saves social resources. However, the current application situation is not so satisfactory. Users passively pay for the resources they do not want because the centers are purchased when constructed. For another thing, both the developers and

educational administration intend to transfer the cost to users so that they can gain the maximum profit. It violates the original intention of resource sharing. The reason of these phenomena is lacking in an effective application strategy to guarantee the sustainable development of construction and application. It severely restricts the development of educational informationalization in Qujing, and is not consistent to the state relevant policies. Under present conditions, we shall take advantage of the educational informationalization opportunity brought by cloud computing to standardize the application strategies and fully integrate the resources and reduce the operation cost. It is valuable to research the realization of resource sharing within the scope of Qujing city.

IV. THE REALISTIC BASIS OF THE EDUCATION RESOURCE SHARING UNDER CLOUD COMPUTING ENVIRONMENT

A. *It is easy to integrate current educational resources using cloud computing.*

Cloud computing is the accomplishing approach of various services. Cloud computing integrates these scattered educational resources with high calculation and handling ability. It removes the repetitive resources, optimizes the resource structure, and distributes the software and hardware systems. Thus the educational resources sharing would be improved and redundancy would be decreased. It supplies the resource services as the users requested, and makes it easier to realize the resource sharing [9]. Though all the current educational resource centers have no interoperability, they can be standardized and concentrated by cloud computing technology to realize the resource sharing among educational departments and schools.

B. *It is easy to realize the resource sharing service platform.*

The education resource centers built by education departments of all levels and schools are combined to form the “cloud” system of education resources under the environment of cloud computing. In such an environment, as for users, they do not need to know the resources are in which “cloud” system, but know what resources they require and how to access to the cloud service system. In this way, users can find out the desirable resources. It seems that they are using their own desktop system, as if there were no cloud service exists. It is completely transparent for users. Hence, in order to improve the convenience of using resource sharing, it is necessary to establish a resource sharing platform. The cloud technology is applied to reduce the complexity of platform realization. This platform is applied to realize the easy access to the requested resources. By this means, the existing instruments and equipments can be taken full advantage and integrated comprehensively. Repeated purchases can be decreased, device efficiency can be

improved and the potential of current resources [7] can be maximized. By the resource sharing platform, the functions are centralized. With the support of cloud computing, the infinite space becomes an integral whole. The “cloud” sharing in physical space can be realized. The users in different regions can use the same educational resources, avoiding the waste of resources and achieving the ideal of resource utilization [9]. At the same time, it breaks the geographic restrictions of resource sharing and promotes the balanced development of education.

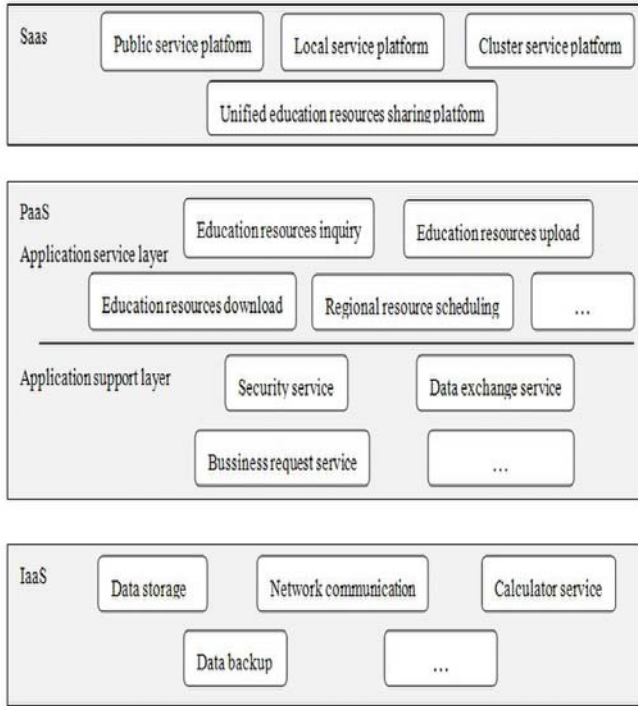
C. *The cloud computing provides a new development opportunity for resource sharing.*

At present, the actual education resource sharing is confined by the development of information technology, leading to some defects to realize the sharing. Taking use of cloud technology can solve this problem. With low requirements for subscriber terminals, cloud computing merely demands that the terminals are able to connect the internet. It is flexible. The laptop, cellphone, iPad and other intelligent devices can be used. To realize the cloud service of educational resources needs the support of high-speed network transmission and powerful calculating ability in network. The wireless broadband network of cloud computing can solve the matters during the transmission, such as deficient bandwidth and low rate [2]. When the cloud technology is used, the educational departments at all levels and schools only need to construct according to the requirements of cloud service providers. There is no need to consider all the aspects, reducing the complexity of system developing and the construction cost.

V. THE QUJING’S EDUCATION RESOURCE SHARING MODE UNDER THE CLOUD COMPUTING ENVIRONMENT

Under the cloud computing environment, Qujing’s education resource sharing is achieved by three service modes of cloud computing, which include IaaS (Infrastructure as a Service), SaaS (Software as a Service) and PaaS (Platform as a Service). Each of them has a corresponding level of resource sharing. In general, Qujing’s education resource sharing can be divided into three levels: infrastructures, teaching resources and applications. The key to realize education resources sharing is the management, application, security and external service of resources. The cloud computing service mode can exactly solve the management and service problems of the three levels [5]. Under this environment, the education resources are managed by professional institutions that are established by education departments. Physically, it runs on the three cloud service centers of city, county, school; logically, it focuses on a unified resource sharing service platform which can provide relative resource service to users as they require.

Based on the current situation of education informationization and application, Qujing's education resource sharing mode under cloud computing environment adopts the hybrid sharing mode combining centralization and decentralization from the application platform construction, content construction, and services construction [11]. Taking the special needs of universality and particularity, flexible allocation of resources, and the combination of centralized management and decentralized applications into account, the framework of education resource sharing service is divided



into three levels to adapt the resource sharing to all users, which are shown in Figure 2.

Figure 2. Cloud computing education resource sharing mode

SaaS layer mainly provides sharing services of software. The public service platform mainly includes public cloud service, which can realize services of unified authentication, resource integration, data services, regional resource scheduling etc. The local service platform integrates various local application systems and interacts with public clouds realizing distributed resources and auto-registration service. The cluster service platform realizes the integration of local cloud service, public cloud and cloud service provided by the third party, by whom these cloud services can interoperate among each other and form highly concentrated clusters of information and services [11]. Unified education resource sharing platform allows users to obtain various resources under the cloud computing environment as simple as desktop systems. Distributed storage resources and heterogeneous systems in the sharing platform are transparent to users.

PaaS layer uses SOA technology to achieve the servitization and external availability of relative functions of educational resources sharing and the supporting applications

platform through service bus. IaaS layer integrates network infrastructure resources, computing service resources, physical communication resources and underlying software system resources. The servers, data storage and others are collected in the center of cloud computing center to manage and maintain. It provides the resources as required in the way of flexible charges [5]. In this way, the education resources in the area can be used efficiently, and conditions of weak schools can deploy low-cost education informatization application so the local education development can be promoted evenly.

VI. THE APPLICATION STRATEGIC ANALYSIS

The purpose of sharing education resources is application. Without this point, everything is meaningless. Therefore, in building a resource sharing system, we should pay much attention to promoting the use of the education resource sharing platform. For this purpose, combined with the current application situation and the diverse needs of users in Qujing, the following application strategies are put forward.

A. Establish a multi-win benefits allocation mechanism.

From the economic perspective, the essence of education resource sharing is the exchange of benefits. In that link, if benefits distributes unevenly for the resource developers, managers, operators or users, it will affect the whole sharing system. Therefore, to reasonably solve the issues of operational authority and charge management is quite essential [12]. It must satisfy the interest of resource developers and consider the consumption capacity of users. At the same time the operators and managers also need to benefit from it, keeping sustainable development of sharing system.

B. Solve the issues of resource security and copyright.

Education resources under the cloud computing environment use a storage technology with high security, but it requires managers with good professional ethics. They need to ensure the safety of users' information and guarantee the education resources from unauthorized access and theft. The sharing system also needs to protect the copyright of education resources, guarantee resources from infringement, and guard the legitimate interests of resource developers during use.

C. Establish the application mechanism of "Everyone builds, everyone shares".

To encourage the front-line teachers to actively develop resources and fully arouse their enthusiasm, an application mechanism must be established to satisfy users who need education resources and meanwhile share their own education resources when using others' resources. It leads the sharing system to developing healthily. This mechanism is "Everyone builds, everyone shares". All of us are developers and also users.

D. Develop mandatory or oriented policies and measures.

Relevant systems and policies of local education departments is an important basis for resource sharing [12]. Some users can actively involve in the work of education resources sharing without the support of policy. But most teachers do not mentally recognize the importance of this work and usually are not much interested in the sharing. Education departments and schools formulate relevant regulations and policies to encourage teachers to participate in the sharing of education resources to achieve the resources optimal allocation. Meanwhile, they carry out targeted training to ensure the information literacy level of users and managers, and the proficiency in the use of resources sharing system. Thus, the follow-up information services are improved.

VII. CONCLUSION

This paper mainly discusses how to achieve education resource sharing mode and the application of the model-based policy analysis under the cloud computing environment. It also points out that the obstacles of achieving education resource sharing are not just a technical issue. It also involves management system, information security, resource copyrights, policies and regulations, distribution of benefits, etc. Thus, to achieve education resource sharing is a great but complex project under the cloud computing environment. It needs the joint efforts of education departments, cloud service providers, resource developers, and users to effectively promote the work of educational resources sharing and to realize the rational allocation and optimize sharing of education resources of Qujing city.

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