

## Public Cloud Platform of Education Governance Based on Internet +

Menggang Li<sup>1</sup> and Xiaolan Guan<sup>2\*</sup>

<sup>1</sup> *Beijing Jiaotong University, China Center for Industrial Security Research, Beijing Center for Industrial Security and Development Research;* <sup>2</sup> *Beijing Institute of Graphic Communication, Beijing Jiaotong University, Beijing Center for Industrial Security and Development Research, (China)*  
*xlguan@bjtu.edu.cn; morganli@vip.sina.com*

### Abstract

*The whole operation mode and management way of education system is undergoing tremendous changes, and the education management informatization has become a necessary condition for the transition from ‘education management’ to ‘education governance’. In this paper, based on Internet +, using the theories and methods of computer science and other related disciplines, we explore the new concept of education governance based on Internet +, and then we analyze the top-level design idea and design principles of the public cloud platform of education governance, mainly focus on the overall architecture, core modules and big data application architecture of the public cloud platform of education governance. Finally we provide a series of effective recommendations for the implementation of the public cloud platform of education governance.*

**Keywords:** *Internet +, Education governance, Public cloud platform, Big data, Cloud computing.*

### 1. Introduction

The issue of education governance has been one of the issues with great concern both at home and abroad universities, while the education governance modernization is a major theoretical and practical transformation to adapt to the changing situation of education, and crack hot and difficult problems. It brings a lot of new requirements to the education system from ‘education management’ to ‘education governance’. First, the participation power will be more diverse, and second, the main responsibilities will be clearer, and third, the operation system will be more efficient. All these require the functioning of the body within the system more scientific, the collaboration more sophisticated, the response more immediate, and the process more optimized. However, the modernization of national education governance is still in the initial stage of building and extensive applications, there are still many typical problems. (1) The idea of emphasizing hardware applications and ignoring software and service still exists. (2) The coordinate effort of each region is not strong, and there are big technology differences between schools, and lack of overall planning. (3) The construction of information system is decentralized, the situation of redundant construction of information systems and islands of information are still widespread. (4) There is still lack of professional teams, funding and mechanisms to guarantee the sustainable development. These also indicate a new development direction for the national education governance reform.

Universities of United States and Europe have been paying attention to the issue of informatization of education governance for a long time, and the general secretary of China Xi Jinping has also emphasized that ‘no informatization, no

modernization'. Modernization of education governance is the theoretical premise of informatization of education governance, while informatization of education governance is the only way to realize the modernization of education governance. Thus, the public cloud platform of education governance based on Internet +, new technologies (cloud computing, big data, mobile Internet), and new model of education governance is imperative to raise the level of modernization of education governance.

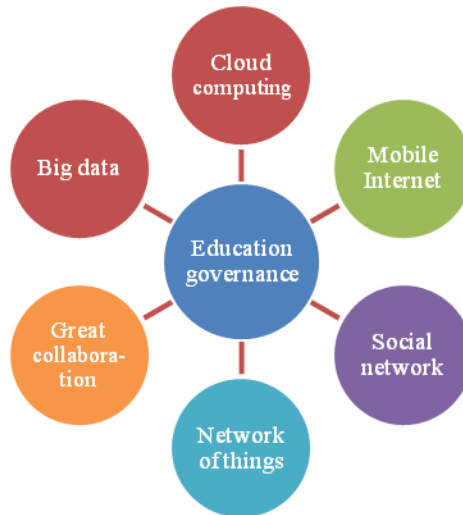
"Internet +" is a new format of Internet which develops based on the innovation 2.0 and a new form that gave birth by the morphological evolution of the Internet and economic and social development of the knowledge society driven by innovation 2.0. It is a further practical result of Internet thinking, represents an advanced productivity, promotes economic patterns continue to evolve, and thus boosts the vitality of social and economic entity, and provides a vast network platform for the reform, innovation and development.

This paper is organized as follows. The second section introduces the new concept of education governance based on Internet +, including big data, cloud computing, mobile Internet, social network, network of things and great collaboration. Then the third section discusses the analysis and design ideas of public cloud platform of education governance based on Internet +, and focuses on the overall architecture, core modules and application architecture of big data under the guidance of top-level design principles. Finally, the fourth section of this paper provides a series of useful advice to the implementation of public cloud platform of education governance based on Internet + and evaluates the implementation effects.

## **2. New Concept of Education Governance based on Internet +**

Once the concept of 'education governance modernization' was put forward, many scholars have analyzed and discussed its content and nature, and have basically formed a consensus that the essence of national governance system is to break the traditional rigid closed supply system and regulate the public, which need to change the supply way of education service under the guidance of the concept of governance. With the Internet +, on the one hand, we can transform the traditional rigid into movement, and form the way of sliding education services by means of the advantage of information. On the other hand, we can also change the traditional closed form into interconnected, and form a sharing common governance education services by means of information technology. They complement each other and eventually combine to form a new orientation of education service supply, and a new idea, new service and new mechanism for the education governance by means of informatization to promote education service supply.

According to the definition of Internet +, the "Internet + education governance" is the cross-border integration of Internet and education. It is designed to promote the rapid development of education and achieve the purpose of  $1 + 1 > 2$ , as shown in Figure 1, through correct playing the optimization and allocation function of big data, cloud computing, mobile Internet, and other information technology in the allocation of education production factors.



**Figure 1. Education Governance based on Internet +**

(1) Big data

With the rapid development of information technology, big data is gradually becoming a new research hotspot after the mobile Internet, cloud computing, and network of things. Some scholars have even called it the ‘new oil of the future’, which shows the large value that big data can bring to humanity. Needless to say, the big data era of education industry has come. The maturity and application of big data technology is gradually changing the way of traditional education governance. The services based on big data have unprecedented huge advantage, such as knowledge mining, data analysis, evaluation of learning services, and so on.

(2) Cloud computing

Although big data can provide huge amounts of data, it is difficult to quickly and accurately analyze them if only relying on manpower or general management information system. Then the emergence of cloud computing has injected new vitality into the development of education industry. The education cloud is the basic infrastructure of future education informatization, and the construction of national education cloud is also an inevitable requirement of the development of education governance. The public service platform of education resource and education governance based on the cloud computing technology has become an established alternative of informatization development of education management.

(3) Mobile Internet

With the rapid development of mobile Internet technology, the increasing popularity of mobile Internet devices, the maturing network environment, and the increasingly rich scenarios of mobile Internet application, the personal mobile learning intelligent terminal is gradually replacing the personal computer as the main form of learning terminal, the mobile Internet technology-based learning environment also widely spreads, and has become an important way to change the way of learning. The application innovation of education governance based on the mobile Internet will also become an important position of innovation development of education management informatization.

(4) Social network

The social network services technology can provide good support for the construction and use of personal learning space, provide basic environment for the promotion of connective teaching mode, so that the connection between the physical learning space and virtual learning space is seamlessly, and truly realize the learner-centered learning. The application innovation of education governance based on the

social network is one of the major trends of the modernization development of education governance.

(5) Network of things

The network of things has come in handy in the area of home-school, education card, intelligent campus, intelligent classroom and other intelligent education area, and it is an important foundation for the building of intelligent classroom, intelligent campus and intelligent learning environment. For example, we can use smart tags to identify the objects which need to learn, record the student's learning behavior, and then adjust the learning content accordingly. We can also install light sensors and controllers in the classroom, and adjust the light intensity in the classroom according to the light intensity and students' position in order to realize intelligent campus.

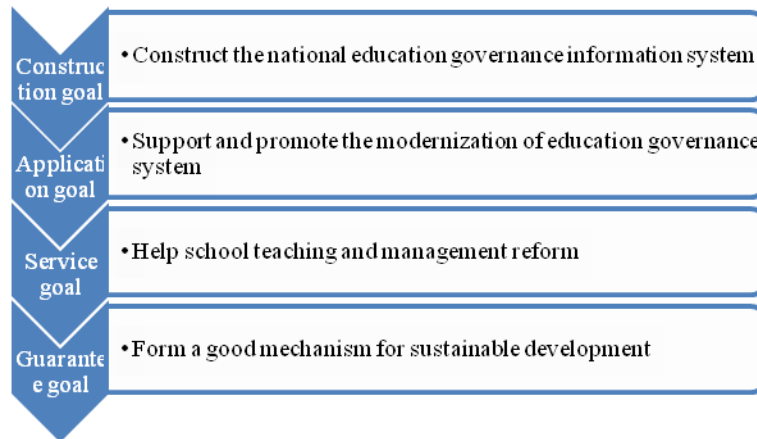
(6) Great collaboration

Education is a unique activity of human society, so it is the subsystem of the social system, and also a complete open and complex system itself. Just because of the dynamic balance development between the various elements of the education system, the whole education system continues to progress and improve. The modernization of education governance is not only inseparable from the collaboration between various elements of education system, but also inseparable from the collaboration between various elements within the social system. It must involve the consultation and cooperation between the community, government, schools, communities, families and even individuals.

### **3. Analysis and Design of Public Cloud Platform of Education Governance based on Internet +**

#### **3.1. Top-level Design**

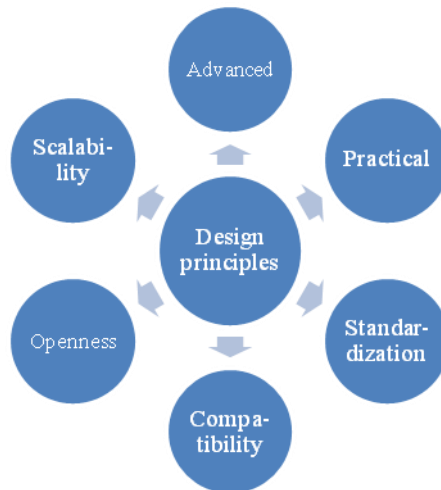
The "education governance" provides a theoretical basis for the education management informatization and also indicates the building direction. The top design of public cloud platform of education governance must take the modernization of education governance as the basis and terminate, so we can determine the design ideas from the following four aspects, namely construction, application, service and security, as shown in Figure 2. The top design of public cloud platform of education governance should be application-oriented, so service is the core of the policy, makes everybody fully understand the role of modern education governance role in practice, and then build a consensus of education governance modernization in the service. It should uphold the concept of overall planning and classification guiding, and fully respect the real needs of all levels, so as to mobilize the construction enthusiasm of everybody. It also should adhere to data-sharing and unified planning and deployment of core business system, make everybody benefit from data sharing, maximize the function potential of modernization of education governance, and achieve down through between core business of education system and core data through unified planning and deployment.



**Figure 2. Top-level Design of Public Cloud Platform of Education Governance based on Internet +**

### 3.2. Design Principles

The design of public cloud platform of education governance should be based on the philosophy of leading the development trend of education governance, mainly follows the advanced principle, practical principle, standardization principle, compatibility principle, openness principle, and scalability principle, as shown in Figure 3.



**Figure 3. Design Principles of Public Cloud Platform of Education Governance based on Internet +**

#### (1) Advanced principle

The public cloud platform of education governance will adopt a multi-layer B / S architecture, use object-oriented application design (OOA) technology, service-oriented (SOA) technology, interface oriented technology, component development technology, use MVC, ORM, Web Service, AJAX and other mature technology, which emphases the specification, robustness and architectural flexibility of the system bottom.

#### (2) Practical principle

The design and development of public cloud platform of education governance will fully consider the convenience and feasibility of data management in various aspects at all business levels, and put the customer needs as the first element to consider, and thus build a smart, efficient, and safe cloud platform.

#### (3) Standardization principle

By introducing the industry's prevailing unified process framework, under the guidance of full development standards, documentation standards, management standards, and quality standards, it can standardize the development process, and improve the reliability and maintainability of public cloud platform of education governance.

(4) Compatibility principle

The server and client of public cloud platform of education governance are based on standardized protocols and interfaces, which can ensure a considerable compatibility.

(5) Openness principle

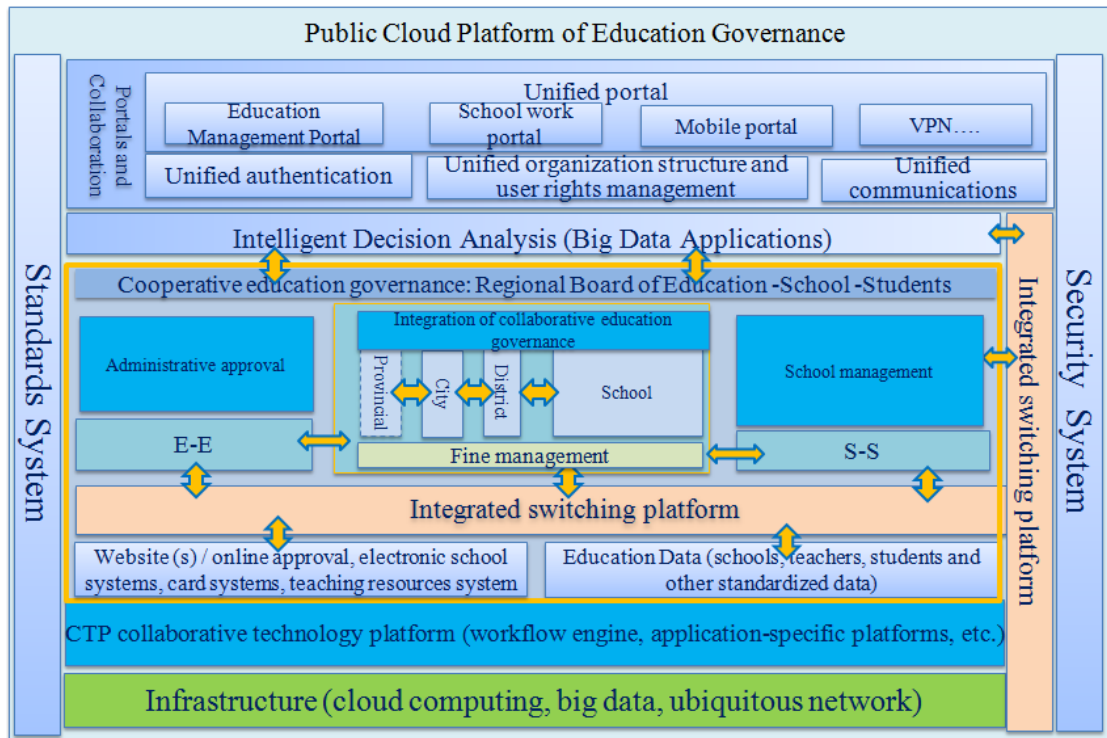
The modules of public cloud platform of education governance use common technical standards in order to ensure an open, easy to expand, and unified software platform which fully supports cross-hardware, cross-operating system, and cross-database, and can realize a smooth transition when the platform expands and upgrades.

(6) Scalability principle

Taking into account the construction of public cloud platform of education governance is a gradual process, there will be follow-up response to the changes in demand to add new features, so the platform will use a modular structure to ensure dynamically scalable.

### 3.3. Overall Architecture

Based on the above design principles, the overall architecture of public cloud platform of education governance will adopt hierarchical and distributed deployment architecture, as shown in Figure 4. By separating the portals and business process layer, it can ensure the logic consistency and stability of the application service, openness of the structure, scalability and maintainability of the function, the parallel nature of development. At the same time, the public cloud platform of education governance will apply multi-platform and multi-architecture development tool which supports "3 \* 3" platform and architecture, namely three main platforms (Android, iOS and Windows) and three main architectures (local, hybrid and mobile Web), in order to realize mobile education governance.

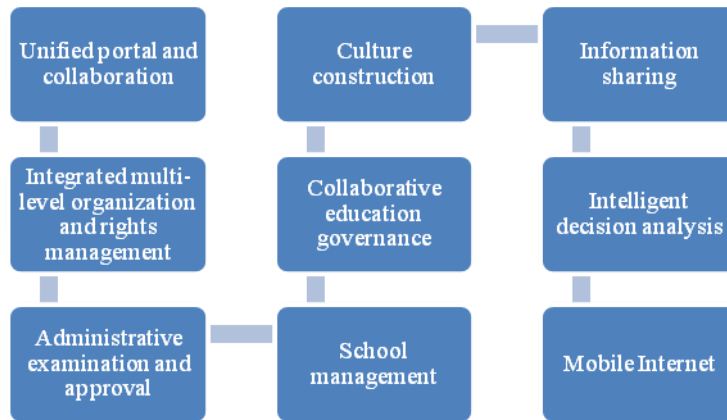


**Figure 4. Overall Architecture of Public Cloud Platform of Education Governance based on Internet +**

The public cloud platform of education governance can realize the continuous collection of basic education data and the national data exchange and sharing, actively explore innovative applications of education management informatization, guide the education administrative departments at all levels to conduct applications using education management information systems and education data, such as business management, decision support, monitoring and supervision, assessment evaluation, and public services, etc., in order to realize fine management process, scientific decision support, continuous data acquisition, diversified evaluation, instant analysis of teaching, and public service of humanity, fully release the potential of education management informatization, so that the education management informatization can play an important role in the transformation of government functions and in the process of supporting and promoting the education governance modernization, significantly improve the levels of decision-making, management and public service of government education, thus promote the modernization of education governance system and management capabilities.

### 3.4. Core Modules

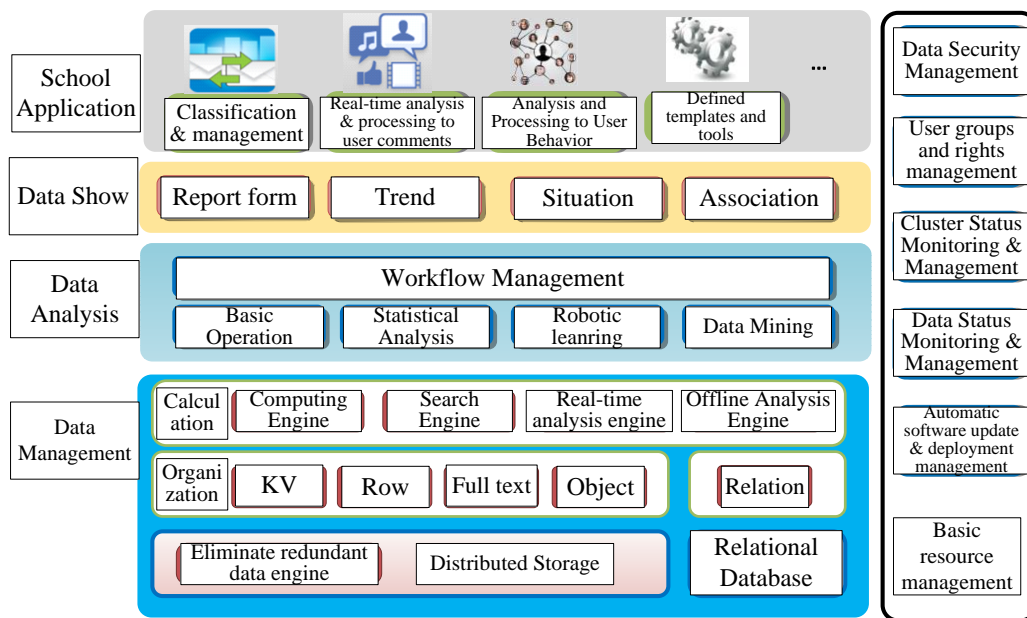
According to the top-level design, the solution of public cloud platform of education governance would be divided into the following 9 modules, namely unified portal and collaboration, integrated multi-level organization and rights management, administrative examination and approval, school management, collaborative education governance, culture construction, information sharing, intelligent decision analysis, and mobile Internet, as shown in Figure 5.



**Figure 5. Core Modules of Public Cloud Platform of Education Governance based on Internet +**

### 3.5. Big Data Architecture

The core functions of big data management of public cloud platform of education governance include the following four components, namely data management, data analysis, data showing, and basic resource management, as shown in Figure 6. The public cloud platform of education governance combines the method of machine learning during the process of data analysis and processing to provide report data, trend analysis, situation assessment, data analysis and other aspects associated with mining for the education management departments. It is mainly used in the following four aspects, including massive data classification and management, real-time analysis and processing of users' evaluation, massive user behavior analysis, and custom query and analysis in education governance.



**Figure 6. Big Data Architecture of Public Cloud Platform of Education Governance based on Internet +**



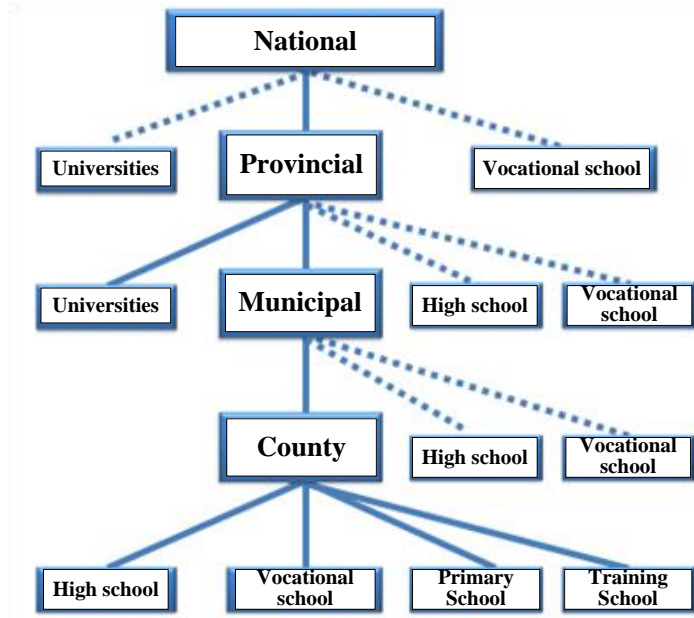
Using intelligent model based on big data, we can conduct intuitive and reliable data analysis and processing to the basic education data and thus provide conclusions and predictions for the education governance decisions which beyond experience judgment, discover new features, and new law of the student learning and teaching process, and provide an important reference for improving scientific decision-making level of education governance and promoting education reform. The unique role of big data analysis will become the new driving force of accelerating the national education governance.

## 4. Implementation of Public Cloud Platform of Education Governance based on Internet +

### 4.1. Implementation Recommendations

#### (1) Organization

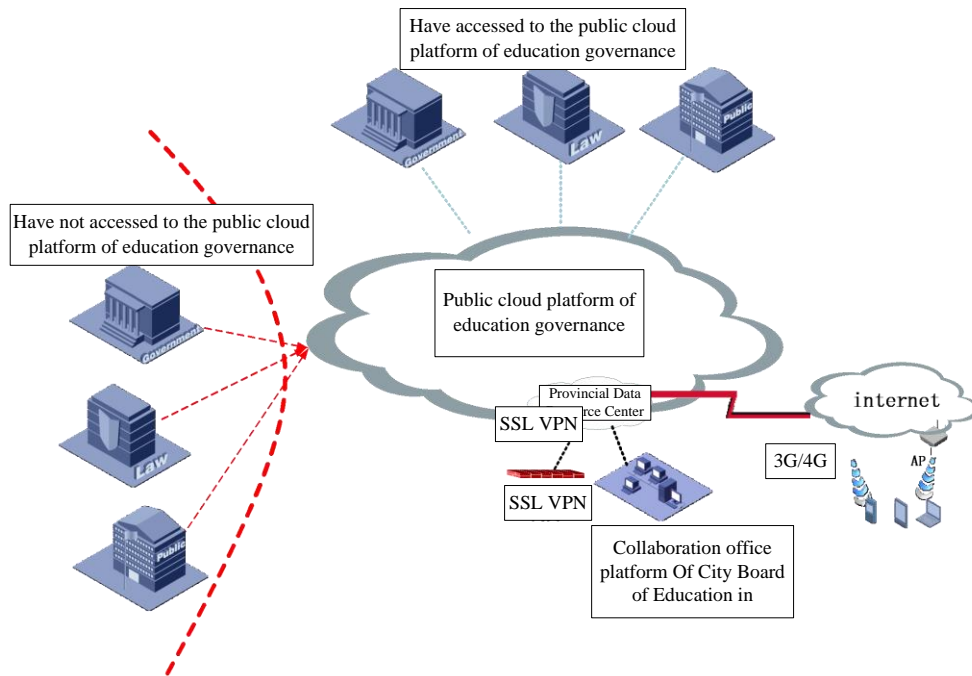
The organization of public cloud platform of education governance is a reticular structure which adapts to the general administrative divisions and education governance system. Take China for example, it can be divided into five levels, namely national, provincial, municipal, county and school. Different levels of the system can exchange and share data through the network, and realize the decentralized management between multi-levels and unified organization user rights management, as shown in Figure 7. It can help to clear the responsibilities, rights and obligations of education administrative departments at all levels and all types of education institutions (schools) in national education management information construction and application, explore effective mechanisms to fully mobilize the initiative of the local, school, social and corporate education, and thus form a virtuous mechanism for sustainable development.



**Figure 7. Organization of Public Cloud Platform of Education Governance based on Internet +**

#### (2) Cloud model

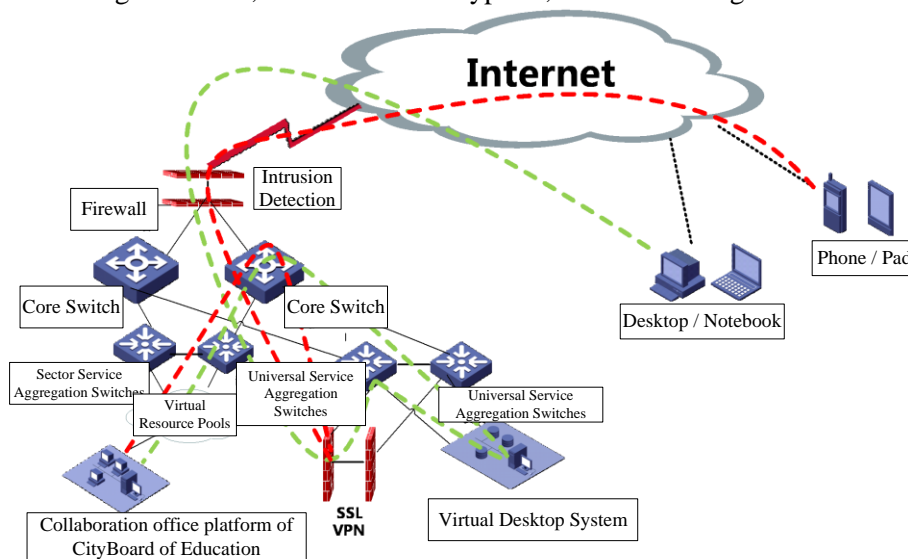
The cloud model of public cloud platform of education governance supports cloud deployment model (virtual deployment) and concurrency, as shown in Figure 8.



**Figure 8. Cloud Model Deployment of Public Cloud Platform of Education Governance based on Internet +**

(3) Mobile Internet

The mobile terminal will use SSL VPN mode to access public cloud platform of education governance, and use SSL encryption, as shown in Figure 9.



**Figure 9. Mobile Internet Access of Public Cloud Platform of Education Governance based on Internet +**

## 4.2. Implementation Evaluation

The public cloud platform of education governance has great value in the aspects of education governance innovation, multi-level governance coordination, sunshine transparent approvals, rapid response linkage, reducing governance and information technology costs, improving office efficiency and so on. It is also very important to deepen the reform of education governance, boost education governance develop towards a more advanced intelligent and collaborative education governance model, effectively change the school management way, and promote the education system functions transferred to the service type.

(1) Construct multi-level collaboration, and build a high-performance education governance system

Through constructing of multi-level education governance collaboration platform, we can unify working platform and access for the educators and administrators, promote standardization of basic data, integration and sharing of information resources, realize cross-sector sharing of education information resources and regional IT platform between sectors and divisions, achieve inter-sector and multi-level business co-education and information linkage, improve administrative office efficiency and thus create high-efficiency and high-performance co-education.

(2) Integrate information resources, and build a service-oriented educational system

Through the integration of public resources and establishment of various types of basic education database and its underlying management information systems, we can provide basic education data and governance decision-making platform for the education administrative departments at all levels and all types of schools, and provide public education information and education management public service platform for people.

(3) Integrate cloud technology, and build an intensive education system

Through building a unified platform and centralized deployment of cloud computing technology, it can make the education sector avoid duplication and waste of resources, save money, and reduce expenditure in hardware and software procurement and infrastructure. Meanwhile, the use of modern information technology can realize paperless office, reduce energy consumption, and thus create an energy-saving and environment-friendly education.

## 5. Conclusions

In this paper, based on Internet +, using the theories and methods of management, synergetics, computer science and other related disciplines, we explored the new concept of education governance based on Internet +, and then we analyzed the top-level design idea and design principles of the public cloud platform of education governance, mainly focused on the overall architecture, core modules and big data application architecture of the public cloud platform of education governance. Finally we provided a series of effective recommendations for the implementation of the public cloud platform of education governance. The public cloud platform of education governance based on Internet + uses advanced technology, and it has the characteristics of management integration, paperless and efficient work, fine management, sunshine approvals, scientific decision-making, systematic security, and intensive construction. It is designed to help realize the modernization of education governance, enhance the regulatory capacity and service level of education management, in order to achieve a new education governance mode which is intelligent, efficient, intensive, sharing, collaborative, integrated, safe and reliable.

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## References

- [1] Z. Du, "To promote education management modernization by education governance informatization", *Research in Educational Development*, no. 3, (2015), p. 71.
- [2] Y. Li, "Public education services research based on "Mobile Internet", no. 1, (2015), pp. 13-18.
- [3] Z. Yang and D. Wu, "Innovation and Development of Education Powered by ICT", *China Education Science*, no. 2, (2014), pp. 57-91.
- [4] Y. Ren, "Top Design of education management informatization from the perspective of education governance", *The Chinese Journal of ICT in Education*, no. 18, (2014), pp. 21-25.
- [5] C. Wang and Y. Zhu, "New Tendency of European Higher Education Governance Research and Its Revelation", *China Higher Education Research*, no. 5, (2014), pp. 13-19.
- [6] J. Zhang, "Modernization of Education Governance System: Standard, Plight and Path", *Research in Education Development*, no. 9, (2014), pp. 27-33.
- [7] Q. Chen and B. Zeng, "Study on the Governance Problems of Disciplines and Specialties Setting in the Perspective of the Stakeholder Theory", *Chongqing Higher Education Research*, vol. 3, no. 2, (2015), pp. 45-50.
- [8] J. Cheng, "Research on the blended-learning mode based on cloud services platform", *Henan Normal University*, (2013).
- [9] H. Gong, "Study on cloud computing based resources sharing platform", *Shaanxi Normal University*, (2013).
- [10] J. Yang, "Construction of Cloud Platform for Laboratory in University and Its Application Case", *Donghua University*, (2014).