Development and Thinking of MOOC in the Era of Big Data

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Abstract. With the rapid development of the Internet and the widespread application of cloud computing-based information storage and data mining technologies, the big data hidden behind information platforms is no longer silent, and there are huge treasures behind seemingly worthless flowing data. More and more people are paying attention. This article studies the status quo of MOOC under the background of big data, and puts forward effective suggestions to promote the sustainable development of MOOC.

Keywords: MOOC, Big Data, Suggestions

1. Introduction
The era of knowledge explosion requires everyone to actively, continuously and openly learn, and autonomous learning based on MOOCs is considered the best way to adapt to this change. MOOC is inseparable from the support of information technology with computer and Internet technology as its core. From a technical perspective: MOOC is a successful case of information technology promoting educational reform. In 1996, Nicholas Negroponte pointed out that digitization is not only a technology, but also a way of survival. Digitization has brought a whole new way of life for human beings. Human beings live in a digital activity space and use digital technology to engage in information dissemination, communication, learning, work and other activities.

MOOC is a product of the era of big data, bringing new ideas and changes to the way of anthropology and teaching. 2012 was the "first year of the international MOOC". MOOCs first flourished in the United States, and then became popular around the world. They cheered from the wealthy United States to the poor and backward Rwanda. China MOOCs started in 2013. After 6 years of rapid development, 12,500 MOOCs have been launched, more than 200 million college students and social learners have studied MOOCs, and 65 million college students have obtained MOOC credits. In the context of the era of big data, re-examining the characteristics, advantages and disadvantages of MOOCs in China has become an unavoidable subject.

2. MOOC and Big Data

2.1 MOOC
MOOC theoretically, “M” means Massive that there is no limit to the number of registered users, and the number of users can exceed 10,000; “O” means Open that anyone can participate and be usually free; “O” means Online that learning activities occur primarily online; “C” means Course that refers to
carefully structured course content.

According to different learning theories, MOOCs are generally divided into three categories: (1) content-based MOOCs (xMOOC): based on behavioral learning theory, emphasizing the diffusion and replication of knowledge; (2) MOOCs based on social networks (cMOOC): based on the communicative learning theory, it emphasizes the connection of knowledge and the creation of learning networks; (3) Task-based MOOC (tMOOC): based on the constructivism learning theory, it emphasizes the understanding and mastery of complex skills.

2.2 Big data
Big data refers to a collection of data that cannot be captured, managed, and processed with conventional software tools within a certain time frame. It is a massive and high growth rate that requires new processing models to have stronger decision-making, insight, processing optimization capabilities, and diverse information assets.

2.3 Relationship between MOOC and Big Data
Hadoop Distributed File System (HDFS) provides reliable data storage services to achieve comprehensive and flexible big data analysis. MapReduce provides high-performance parallel data processing services [1]. These big data technologies have revolutionized the economy, science, and society. Big data and large-capacity high-speed processing and processing capabilities have expanded the capacity of online courses, increased the number of online students, and prepared a sufficient hardware environment for the birth of MOOC. In 2013, EdX, founded by Harvard University and Massachusetts Institute of Technology, provides 175 online courses and has more than 1 million students taking elective courses.

Large-scale student group learning has increased individual differences and diversity, and developing personalized chemistry learning has become a difficult problem in MOOC education. High-performance data parallel processing speeds up the processing speed and provides technical guarantee for the interactive and real-time nature of MOOC teaching. Real-time recording of learner learning behavior data provides support for further learning modeling and data analysis, and provides a basis for testing the effectiveness of instructional design. With the rapid development of science and technology and the deep integration of the Internet and open education, social learning has become a major form of learning. Socialized learning "is the interaction in society through dialogue content and perspectives, especially around other people's problems or actions." The importance of socialized interactive learning has also been confirmed. Based on his college experience, Richard Wright finds that students gain more from the knowledge gained by participating in small research groups than by individual learning alone. MOOC has catered to this demand and built a platform for sharing resources, creating knowledge, and building a learning network. Learners can use MOOCs to achieve ubiquitous learning beyond time and space. Individuals bring their own experience into a co-constructed community for communication and interaction, and build social knowledge. At the same time, through collective "scaffolding" to assist each other, expand understanding and complete individual projects; the construction of knowledge is achieved through the connection of learners, information and communication platforms.

MOOC has attracted a large number of learners through its high-quality, free educational resources. They are located around the world, register through the Internet, and apply for courses. In the process, these people have become a special group of people. They have a high level of information literacy, an idea to improve themselves, and a strong interest in a particular area of expertise. If you use big data for analysis, you can clearly see the learners who have finally completed the course and obtained the certification through the test. These learners are talents with various excellent qualities. Therefore, the background data of MOOC can successfully identify such talents. In our country with huge population data, we should effectively use the MOOC big data to attract and identify talents. Because mastering talent means mastering the advantages of competition in the international situation.
3. The main problems and countermeasures of MOOC development

3.1 Cost issues
Li Xiaoming believes that the biggest obstacle to MOOCs is not to raise funds to purchase equipment, but to be able to put the courses on the campus network, because the general cost will be so high that people will give up. The reason lies in the lack of an effective spirit and practice of open sharing in intellectual property arrangements. There is no explicit requirement that the MOOC producer sign a Creative Commons (CC) license agreement. The issue of MOOC use rights will greatly hinder resource sharing \[1\]. Even though all public cloud platforms are free of charge, the bandwidth, management system, and assessment mode of each school are very different. It is expensive to develop a customized version and interface for the platform provider.

The solution is to establish a resource sharing mechanism. In order to reduce social costs, maximize the use of high-quality resources, and solve the problem of use rights, "It is recommended to use the internationally recognized Creative Commons (CC) license agreement to protect both the copyright of the MOOC authors and exclude Unnecessary obstacles affecting open sharing." Schools can use MOOCs on the school platform, and other non-commercial platforms can also be deployed. For example, Universitat Politecnica de Valencia joined edx.org and relied on self-built low-cost MOOCs and other shared resources on the platform to obtain 50 courses, 177 versions, and more than 632,000 registered users. And after-school surveys show that student satisfaction is high.\[2\]

The source of teaching must be specified. Initiating the identification of national MOOCs is of great significance in cracking down on barriers to use. For example, the National Excellent Online Open Course identified by the China’s Ministry of Education requires that “open to colleges and social learners and provide teaching services for no less than 5 years. Colleges and universities must provide the course team with support in terms of policies and funding." The Ministry of Education's latest three-year national excellent online open course construction plan is shown in Table 1,\[3\]

| Course type                                | Quantity | Do they use MOOC? | Do they use big data? |
|--------------------------------------------|----------|-------------------|-----------------------|
| National Online First Class Course         | 4000     | Yes               | Yes                   |
| National offline first-class course        | 4000     | NO                | NO                    |
| National online and offline mixed first-class courses | 6000     | Yes               | Yes                   |
| National Virtual Simulation Experiment Teaching Class | 1500     | Yes               | Yes                   |
| National Social Practice First Class Course| 1000     | NO                | NO                    |

China's Ministry of Education plans to complete 4,000 national first-class online courses (national boutique online open courses), 4,000 national first-class offline courses, and 6,000 national online-offline mixed courses in the three years from 2019 to 2021. First-class courses, 1,500 first-class courses in national virtual simulation experimental teaching, and 1,000 national-level social practice first-class courses. Among them, national-level online first-class courses, national-level online and offline mixed first-class courses, and national first-class courses in virtual simulation experimental teaching all use MOOC based on big data technology to teach, accounting for 70% of the total number of plans.

3.2 Management issues
The complexity of teaching management and data processing is also a bottleneck that hinders the
development of MOOC. The public MOOC platform cannot meet the individual needs of the school. [4] Students' course selection data and test scores can only be imported and exported manually. If customized, the investment is large and the cost performance is low. A large number of courses and a large number of people who choose the course will bring problems such as insufficient bandwidth and complex data interfaces. The workload of teachers is more than before. Although offline classroom time has decreased, working hours have increased, especially during the first round of MOOC classes. Li Xiuli surveyed 150 lecturers and students who obtained the certificate of completion on four platforms of MOOC, Chinese University MOOC, xuetangx.com, CNMOOC, and Guokr.com. The average is about 23 hours, while traditional courses only take about 2-5 hours to complete, and the time spent running a course every week is less than 4-8 hours. [5] The 2012 survey report *Tracking Course: Ten years of tracking online education in the United States* state that compared to traditional face-to-face courses, MOOCs will require teachers to pay more time and energy. A survey of 143 MOOC users found various challenges in MOOC teaching methods, resources and logistics. Challenges in teaching methods include learning goals, assessment methods, course length, course content, flexibility, and collaborative learning support. Resource challenges include providing MOOC platforms, support from major institutions and platforms, and available knowledge and hardware resources. Logistical challenges include teachers spending more time designing MOOCs. [6]

The solution is to establish a professional course team and an intelligent management service system. The operation of a MOOC includes course production, the use of information technology and methods, the construction and maintenance of teaching resources, and the asynchronous management, monitoring, and monitoring of learner behavior and performance. Evaluation, etc., is difficult to achieve by teachers alone. The era of big data has completely changed the situation of fighting alone in the past. It is an inevitable trend of the times to integrate teacher resources and promote team building. The intelligent course teaching service system helps to improve the efficiency of teaching management. According to the needs, team building can be refined into several different directions: course lecture team, teaching management team and technical support team. Some schools are limited with network facilities and lack professional media production staff. They can choose professional and standardized companies for filming, editing and production. After being put into operation, each team has its own responsibility.

4. Conclusion

In the era of big data, MOOC uses cloud computing, data mining, data analysis and other technologies to interpret MOOC in depth. [7] It constantly organizes and combines the learning behavior data of MOOC learners to find out the interrelationships and related trends of information data in order to reflect the learner's true level and learning ability and reveal the characteristics of the learner. On this basis, differentiated teaching, platform adaptation, construction of personal growth system, and construction of an objective evaluation system will naturally occur, thereby guiding the construction and development of the MOOC platform.

Under the guidance of big data, learners continue to acquire knowledge through the MOOC platform, and at the same time, they have become the builders of MOOC. By continuously helping the platform to improve, the MOOC platform is further attractive to learners. Enhance the learning interest of learners, and then attract more learners to join the learning and construction of MOOC, forming a virtuous circle. The significance of MOOC is no longer just to provide learners with free, convenient and high-quality educational resources. It should also become the basis of teaching reform and the support of educational strategies, Exploring the future and development of MOOC, the study of big data cannot be ignored.

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