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EDUCATION INFORMATIZATION IN CHINA DURING THE ICT (INFORMATION AND COMMUNICATION TECHNOLOGY) ERA

by

Yuqi Zhong

B.A., University of International Business and Economics, 2018

A Research Paper

Submitted in Partial Fulfillment of the Requirements for the

Master of Science

Department of Mass Communication and Media Arts
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RESEARCH PAPER APPROVAL

EDUCATION INFORMATIZATION IN CHINA DURING THE ICT (INFORMATION AND COMMUNICATION TECHNOLOGY) ERA

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A Research Paper Submitted in Partial

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for the Degree of

Master of Science

in the field of Professional Media and Media Management

Approved by:

Dr. Dong Han, Chair

Graduate School
Southern Illinois University Carbondale
April 6, 2020

AN ABSTRACT OF THE RESEARCH PAPER OF

Yuqi Zhong, for the Master of Science degree in Professional Media and Media Management, presented on April 6, 2020, at Southern Illinois University Carbondale.

TITLE: EDUCATION INFORMATIZATION IN CHINA DURING THE ICT (INFORMATION AND COMMUNICATION TECHNOLOGY) ERA

MAJOR PROFESSOR: Dr. Dong Han

Most countries, including China, consider education informatization as a way to meet with social demands of well-trained workers and technological innovations. The development of ICT (information and communication technology) provides advanced infrastructure for education informatization, especially in rural areas. The education informatization in China started in 1978. Since then, various significant projects and plans have been made and implemented, including *Action Plan for Invigorating Education Towards the 21st Century*, *Campus Access to ICTs, Modern Long-Distance Education in Rural Primary and Secondary Schools*, and *Three Connections & Two Platforms*. This thesis gathers and analyzes state policies, rules, reports, documents and publications to understand goals, emphases, and targets of these projects or plans.

During the process of pursing education informatization, the scale of ICT economy has also increased. It cannot be denied that education informatization boosts the development of ICT and education industry. Digital divide between urban and rural areas has been narrowed down in terms of technology. However, because of comparably lower developmental levels of economy and education, it is still a long way to go for people and students in rural areas to increase their awareness and utilization of media and information technologies.

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My life in Carbondale is peaceful and impressive. As an international student, I felt life here was extremely hard at the very beginning. It took me quite a long time to get used to life in this small town. I met a lot of professors, friends, office staffs who are trying to help me without hesitation every time I need their help. I appreciate all of them very much.

Life in Carbondale is kind of boring. However, it gives me abundance time to talk with myself so that I have chances to think who I am, what I want to be and what I am interested in. I may be lost in city life. However, I think that I am learning something new every day at here. I want to say thanks to Philp Greer who helped me apply for SIU two years ago. I was stressed at that time. He spent so much time on comforting me. He always trusts me and encourages me to do whatever I want. I want to thank Prof. Babcock who helped my application for graduate school and always talked with me in his office hour. We had nice conversations every time. I think I am lucky because every time I feel bad, Rachel, Meredith, Ben, Justin and Fred were around me. And yes, they are the people who gave me rides to grocery stores in Carbondale. Thanks for the company from Haoran and Weikang. Thanks for the help from the perfect and considering staffs at Ambassador Hall. Also, I want to thank some friends in China. They are Qianyu, Yue, Xing and Xiaoran. They are the people who were willing to spend time with me when I lost my sleep at some nights. My lonely night seemed not to be that lonely when I had friends with me.

Last but not least, thanks for help and patience from Prof. Han. Thanks for supports from my parents.

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INTRODUCTION

1.1 The development of ICT (information and communication technology)

The “dramatic revolution in information and communications technology” has started since the late 1990s, which is in fact “convergence of the IT industry and the communication industry” that can be seen as “the major driving force” of economy (Meng & Li, 2002). ICT is often “identified as a key to improve the resource allocation process and to more efficiently implement programs” (Heeks, 2010).

Due to global economic crisis in 2008, there has been a difficult macroenvironment, including deflation and slow recovery for most countries worldwide, because of the reach of global capitalism into most countries. In this circumstance, China have some structural imbalances brought by global economic crisis. Based on “investment and export-driven growth”, China’s economy has deeply been affected by the market of “traditional manufacturing and real estate”, which means when “oversea demand slackened”, “China’s economy slid into a structural gridlock” (Hong, 2017). According to Hong (2017), “China’s GDP growth in 2015 fell below the 7% benchmark for the first time in decades”, which gradually makes ICT development a highlight in the national strategy. Also, according to Whyman (2014), there is not only a “major supply chain” in China, but also “the largest national market for smartphones, PCs, and e-commerce”, which implies that China’s ICT industry is easily to be affected by “global market varies”. In the first half of 2016, the imports and exports number of ICT products including PCs, handsets, components, and telecom equipment”, fell 8.1% (MIIT, 2016b). As a result, the revenue in the first six months decreased. Faced with slackened global ICT market, the importance of domestic market cannot be ignored this time because more than half of the ICT

products made in China was sold in China during 2015, which means the stimulation of "domestic information consumption" is necessary and reasonable. Therefore, it is indisputable that China has to push itself to go through economic restructure as part of the digital capitalistic development.

The major and latest ICT related policy can be found in China's 13th Five-Year Plan (FYP) that regards ICT sector as "highest priority" in economy (Kennedy & Johnson, 2016). The 12th FYP is the first FYP that associated economic development with ICT industry (Atkinson, 2014). During the period of 12th FYP, cultural industry was regarded as economic pivot. Also, there were comprehensive ICT applications into many aspects of social life. According to Hong (2017), if the 12th indicates that "policy makers came to terms with the pitfalls of the old growth model and were embarking on transitional measure", then 13th FYP mentions a future vision that China has been putting efforts on. For 13th FYP, supply-side reform which is aimed to reduce excess capacity in traditional and old manufacturing and real estate industry, takes new priority (Naughton, 2016). The key principle of supply-side reform is innovation which is stimulated and encouraged by central government and reminds the public of the importance of science and technology.

Due to the policy supports from government, according to Hong (2017), China built the "largest 3G mobile communications network with a China-only standard" during 11th FYP which was an "unwelcomed" establishment for western countries that almost dominated the global communication market. Later, China became the largest 4G communication network in the world. For the coming 5G era, China has been preparing and anticipating since 2016 and try to define the 5G standard, which can be seen as a signal that China is actively trying to intervene the western-dominated telecoms world (Zhang, 2016).

1.2 The development of Education Informatization

The development of ICT has laid a solid foundation for that of education informatization in China. Most countries in the world has started the process of education informatization because of the social demands of well-educated workers and technological innovations. Education informatization is regarded as an important aspect of educational modernization. In the past 20 years, China has achieved a lot in the process of education informatization: IT infrastructure, education resources and personnel training have developed tremendously and built a solid foundation for further development. It is believed that education informatization in China started in the 1980s, and then steadily developed in the 1990s. There is a significant developmental stage since 2000. There are some important and systematic projects and plans in the new century. For the projects, they are mainly "*Campus Access to ICTs*" project, "*Modern Long Distance Education in Rural Primary and Secondary Schools*" project, "*Cloud Computing in Education Informatization*" project and "*Three Connections & Two Platforms*" project which is mainly about schools and people's accesses to ICTs, educational resources, online platform of study, educational management and educational resources. As for plans, there are some significant ones, including *2003-2007 Year Education Promotion Motion Plan*, *National Outline for Medium and Long-term Educational Reform and Development (2010–2020)*, *National Development Plan for ICT in Education (2011–2020)*, *13th Five-Year Plan of National Education and 13th Five-Year Plan of Education Informatization*. In 2018, Ministry of Education of China made a plan, *Education Informatization 2.0 Action Plan*, which can be seen as an upgrade version of education informatization beforehand which is regarded as the 1.0 version mainly focusing on the construction of "Three Connections and Two Platforms". Generally, the 2.0 version of education informatization is based on the achievements of 1.0

version. According to Ministry of Education of China (2018), it can be known that the goal of the 2.0 version of education informatization is to comprehensively upgrade the quality of education informatization, which addresses three points including the idea of smart education, education modernization and global leading role in education informatization process.

Overall, there are a lot of great achievements in the process of education informatization in the past 40 years. The 2.0 version of education informatization presents a new goal and a new developing idea that can be seen as a huge leap forward.

1.3 Research significance

There are a lot of studies of education informatization in economically developed countries, including the United States, the United Kingdom, Singapore, Korean and so on. Among these studies, most topics are about education informatization in the United States, which is widely accepted as the first country that came up with the idea of education informatization and started related national projects. Only few focused on some developing countries. Therefore, it is necessary to have a complete analysis of education informatization in developing countries. As for this project, there will be a systematic analysis of education informatization in China. For the domestic studies of education informatization in China, most scholars try to understand and analyze one specific policy or project during one developmental stage of ICT or education informatization, which pays inadequate attention to other more specific policies and projects. Moreover, there is no chorological, complete and systematic analysis of education informatization process in China and achievements and evaluation during the process.

1.4 Structure of project

The thesis will be divided into five parts. The first part is the general introduction of the topic, including research background, research significance and the layout of the thesis. Chapter

two serves as the literature review for the research. It presents the previous researches on the ICT, ICT education and education informatization in China and the world. Chapter three is about research methodology. It consists of research questions and research methods. Chapter four is the part of results and discussion. In this part, there would be the analysis of the policies of education informatization and related projects in a chorological order. Also, the features of education informatization in China will be discussed. Chapter five, the conclusion part, summarizes the findings as well as implication and limitations of this thesis.

CHAPTER 2

LITERATURE REVIEW

2.1 Previous studies of ICT

According to Fu (2013), ICT includes "computers, the Internet, and electronic delivery systems such as radios, televisions, and projectors among others". Zhang & Aikman (2007) stated that ICT can be seen as the most important part of most organizations and businesses these days. According to Bankole et al. (2011), ICT can be regarded as a platform for an information society. Many other scholars (Deliktas & Kok, 2003 and Hicks & Streeten, 1979) stated that ICT transformed the whole society into an information-intensive society, and it could also affect every aspects of society, the likes of economy, politics, culture and so on. Touray et al. (2013) indicated that "the achievement in today's ICT domain could not exclude tremendous role of the Internet because it provided the platform for any meaningful web-based application". As for technologies, according to Loyld (2005), they include both hardware and software. The former includes computers and other devices. The latter includes connection to Internet, related infrastructure and videoconferencing.

As for relationship between ICT and economy development, Dedrick and Kraemer (2001) pointed that there is a "productivity paradox" which means when more investments are made in business, the productivity may be deceasing instead of increasing. Heshmati & Yang (2006) stated that it has been proved that "ICT in developed nations is significant and positive, but not in developing countries". However, Meng and Li (2002) mentioned that there were some evidences in China that can show ICT development, its diffusion and some astonishing economy achievements, while there was a huge gap between China and some western developed countries.

2.2 Previous studies of ICT in education

Computers has been equipped in schools in the early 1980s because people believe that ICT can benefit the whole society (Bransford, Brown, &Cocking, 2000; Grimus, 2000; Yelland, 2001). Kent and Facer (2004) stated that school is a place where students can participate in various computer activities, while home can be only seen as a place where there is a narrow range of computer activities. There are various ways to improve teaching and learning in class (Lefebvre, Deaudelin & Loiselle, 2006). Kim & Lee (2011) once stated that "education informatization has had significant impact on improving classroom teaching". And "there have been numerous studies involving elementary schools, middle schools and special education schools". According to Dawes (2001), technologies can extremely support education and benefit the communication between teachers, parents and students. According to Fu (2013), "learning can occur anytime and anywhere", and online course materials "can be accessible 24 hours a day, seven days a week". And "teleconferencing classrooms allow both learner and teacher to interact simultaneously with ease and convenience". There were a lot of studies that focus on appropriate use of ICT which improves the quality of education and combines learning and real-life situations (Lowther, et al. 2008; Weert and Tatnall 2005).

As for benefits of using ICT in education, Fu (2013) concluded five points on the basis of various studies of this topic. Using ICT in education can "assist students in accessing digital information efficiently and effectively", "support student-centered and self-directed learning", "produce a creative learning environment", "promote collaborative learning in a distance-learning environment", "offer more opportunities to develop critical (higher-order) thinking skills", "improve teaching and learning quality" and "support teaching by facilitating access to course content". Dawes (2001) also stated that there may be problems when teachers have to make changes "in what may well be adverse circumstances". Bingimlas (2009) mentioned that

given the fact that ICT plays an important role in education, it was also a significant step to identify some possible obstacles to take advantage of these technologies.

Kim & Lee (2011) mentioned that there are two types of studies for educational informatization. The first is “comparative studies were conducted at the national level”, which focuses on “the ability to use information devices, improvement of Internet accessibility, and selection and utilization of educational materials”. For example, studies were conducted in 18 countries to analyze the utilization of ICT (Junghee et al., 2006). To be specific, Pejova (2002) stated that as for the topics of information devices, Internet accesses and educational resources, many international organizations, the likes of “EU, OECD, and UNESCO” , discussed “how to measure ICT competency” which benefits the development of new educational materials and new class content. The second type of studies are aimed for analyzing “the current status of education informatization in different regions or in elementary and middle schools, and to compare the informatization levels among school levels or among schools”. According to Junghee et al., (2006), the Asia-Pacific Educational Executive Office of UNESCO carried out the project of ICT utilization in every country from 2002 to 2004.

For related studies in China, according to Sun (2004), ICT in education started from audio-visual and educational technologies, which means people should learn about ICT from its “objectives and contents”, and instructors should teach with ICT via its means and methods. Based on the analysis of development of ICT education in China, Wang and Song (2002) stated that there were two stages identified through the process, the technology-determined stage from 1986 to 2000, and a systematic stage that technology started to be gradually connected with education. For the first stage, ICT related equipment, the likes of computers, printers, and projectors, were purchased by schools. During this process, the main problem was that teachers’

understanding, and competency of ICT could not help them fully apply new technologies into practices. Then people realized that hardware-dominated approach should be improved, which means some new strategies should be implemented to facilitate the integration of education and ICT. And this was the second stage of ICT education in China, which refined the traditional ways of teaching.

Wang and Shi (2004) analyzed textbooks, teaching equipment, students and teachers, such key aspects of ICT education. Huang (2008) paid attention to ICT application in basic education. The results showed that the information literacy of students and teacher both need to be increased. Wang (2008) indicated some challenges of ICT education in rural areas of China, including few financial funding, small number of teachers and limited understanding of ICT education. The junior-high schools in six areas in China have been studied by Xie and Wang (2004). The results showed that some educational practitioners could not totally understand the role of ICT in education and could not receive systematic training about how to use ICT and take advantage of online educational materials, which indicated that there was still a long way to go for ICT education in rural areas in China. Many scholars (Wang, 2009 and Wang, Wu, and Shao 2003) analyzed the practice of ICT application in education and summed up the related achievements in National Projects, including the projects of Campus Access to ICTs and Distance Education in Rural Areas. Based on the studies above, it can be known that the significant achievements have been made during the process, which can be seen as a fundamental foundation for educational modernization in China.

The current stage of ICT education in China has been generalized above. Based on these literatures, it can be known that Chines government has implemented various national projects across the country. And the development of ICT education has achieved a lot but there is still a

long way to go in regard of information literacy of both instructors and students, using effectiveness of ICT equipment and the reginal gap.

2.3 Previous studies of education informatization

It is hard to investigate when the term education informatization was formed. Generally, it is widely believed that the idea of education informatization came with the project of National Information Infrastructure (NII) in 1993 in the United States (Zhu, 2011). According to Schulte (2015), “ICTs for education (ICT4E) are considered promising tools for promoting self-directed, creative learning and bridging various divides, such as those between developed and developing countries, urban and rural regions, and so on”. Technologies should be utilized to narrow down gap between “developed and developing countries, urban and rural regions, affluent and poor neighborhoods, and so on, by spreading the most up-to-date knowledge and skills to every classroom on the globe” (Schulte, 2015). Schulte (2015) also stated that informatization can be regarded as the spring of powers among “economic growth, effectiveness of political and administrative rule, military strength, enhanced national security, environmental protection, provision of health services, facilitation of commerce, and cultural revival”. According to Robert and Lavina (2012), education informatization is a kind of pedagogical science which is associated with the tools of ICT in education. Robert et al. (2017) stated that education informatization can be regarded as “a task-oriented process of providing the educational sphere with the methodology, theory, technology and practice of developing and optimizing the use of ICT tools in health-saving conditions, which is focused on the implementation of the objectives of education and development of a person, the process that includes the subsystems of education and upbringing”.

For related studies in China, according to Wu and Tang (2013), education informatization

is about taking advantages of "modern information technology such as computers, multimedia and network technology in the field of education to promote updating of educational concepts, the reform of education content and methods and learning ways" in order to train talented, well-educated and innovative people who can contribute to the social development. Wu and Tang (2013) further mentioned two typical features of education informatization: the first one is from the perspective of technology that "the transmission equipment are digitalized and intelligent", and the way of dissemination is "networked and multi-mediatized"; the second one is on the basis of universal and diverse education resources which refers to the "interactive and personized" education process, the combination of virtual environment indicating online resources and real teaching multimedia, and "collaborative and autonomous" learning styles.

Chinese government has been putting a lot of efforts on education informatization since 1990s. According to Ren (2019), there are four stages of education informatization in China. The first one was from 1978 to 1999 which can be seen as the sprout period that came along with the idea of distant education, life-long learning process and open education network. The second phase was from 2000 to 2010 during which a lot of specific and practical projects were established, including "Campus Access to ICTs" network project that bridges the communication between parents, school and other educational resources online. In this period, the national education system and Internet infrastructure were enhanced, which can be seen as solid foundation of further development of education informatization. The third stage was from 2010 to 2016 during which the idea that Internet technologies have revolutionary effects on national education development was accepted and ran through the whole time. Education informatization started to be associated with education modernization. The current stage was from 2018 called the 2.0 version of education informatization which focuses on solving social contradiction

between the people's growing demand for fair and quality education, and imbalanced and inadequate education development.

According to Wang & Xing (2011), the current status of education informatization in China is with high speed of infrastructure, but ICT are not applied into practice very well. Also, there are the "lack and the imbalance of educational resources" which is "updated slowly and shared at a low level". Rural schools face unique challenges associated with geographic isolation, racial segregation, and limited school and community resources (Johnson & Strange, 2007). Barker and Hall (1994) suggested education—including the use of Internet and web-based materials, interactive television, computer conferencing, and multimedia modules—as at least a partial solution to some of the problems that rural schools face. According to Zhao & Xu (2010), the application of ICT education in rural communities " offers an ideal environment to teachers and students in rural areas in China", while "most educational practitioners cannot understand the nature of ICT in education very well, have not received systematic education for how to use ICT, could not utilize information resources, lacked sufficient training and paid little attention to the importance of ICT training either".

2.4 Summary

In this chapter, the studies of ICT, ICT in education and education informatization abroad and in China have been carefully reviewed. It can be easily understood that the development of ICT industry paves the way for that of ICT in education and then education informatization. Various scholars try to understand the role of ICT in the economy, and some argue that ICT plays a very significant role. However, it is generally admitted that there is a great regional digital gap in the world. In the field of ICT in education, a numerous number of scholars try to figure out how ICT support educational system and the role of ICT in education. As for the

studies of education informatization, at the beginning, most scholars tried to define the key concept of it and then the significant role of it in the development of society and education modernization. Whether in China or other countries, the studies of ICT in education or education informatization tend to take micro-perspectives, either specific periods of education, e.g., primary, higher, vocational education, or specific regions. Few studies focus on a macro-analysis of systematic, chronological plans and projects in one country.

CHAPTER 3

METHODOLOGY

The following research questions will be answered in this paper:

1. What are governmental policies of education informatization in China? what are main emphases on the policies?

2. How are the policies implemented? What are the achievements?

3. Is education informatization only for national education development? Does education informatization boost the development of related industry?

4. Is digital gap narrowed down by the construction of ICT on campus?

This thesis includes extensive documentary research, which involves the use of credible journalistic sources and governmental documents to support the viewpoint or argument of an academic work. The process of documentary research also involves selecting, assessing and conceptualizing documents.

Documentary research requires the collection of governmental documents of policies as primary source and the collection of secondary resources including academic papers, newspapers and conferences documents. To be specific, the primary source can be found on the official website of Ministry of Education of the People's Republic of China from which the original documents of policies and its achievements are disclosed, including National medium and long-term educational reform and development program (2010-2020), 13th Five-Year Plan of National Education and Ten Years of Education Informatization Development Plan (2011-2020) and so on.

This research mainly focuses on the practice of education informatization in the ICT era in China. Therefore, governmental policies of education informatization through years will be

carefully analyzed to understand the topic. Also, what government, corporations and school do and corporate to implement the policies has been carefully reviewed via annual/monthly reports disclosed on the official website of Ministry of Education and some other academic papers, conferences paper and newspapers.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Key policies and plans

Education informatization in China is a systematic and complex project. As reviewed in literature review, Ren (2019) states that there are four stages for education informatization in China. The following are the key plans and policies in every stage. Looking back to the following key projects and plans, it can be known that the whole process of education informatization in China started with several points and unique ideas, then developed across country via some comprehensive projects among regions, especially rural areas. Finally, higher standards were brought up to adjust to higher developmental level of society.

Table 4.1 Key Plans and Projects on Education Informatization in China

Period	Time	Name
First Phase (1978-1999)	1998	Action Plan for Invigorating Education Towards the 21st Century
	1999	Decisions on Deepening Education Reform and Promoting Quality Education
Second Phase (2000-2010)	2000	The Project of Campus Access to ICTs

	2000	National Conference about ICT in Education in Primary and Secondary School
	2002	The Tenth Five-Year Plan for Educational Technology
	2003	The Project of Modern Long-Distance Education in Rural Primary and Secondary Schools
	2004	2003–2007 Action Plan for Invigorating Education
	2006	National Plan for Medium- and Long-Term Scientific and Technological Development (2006–2020)
	2006	The State Informatization Development Strategy (2006–2020)
	2007	The Eleventh Five-Year Plan for National Education Development

Third Phase (2010-2016)	2010	National Outline for Medium and Long-term Educational Reform and Development (2010–2020)
	2012	Ten-Year Development Plan of Educational Informatization (2011-2020)
	2012	National ICT in Education Work Video Conference
	2012	The Twelfth Five-Year Plan for National Education Development
	2014	The Key Work Points of Education Informatization in 2014
	2015	The Key Work Points of Education Informatization in 2015
	2016	The Key Work Points of Education Informatization in 2016
	2016	The Thirteenth Five-Year Plan for Educational Technology

	2017	The Thirteenth Five-Year Plan for National Education Development
	2017	The Key Work Points of Education Informatization in 2017
Current Stage since 2018	2018	The Key Work Points of Education Informatization and Network Security in 2018
	2018	Education Informatization 2.0 Action Plan
	2019	The Key Work Points of Education Informatization and Network Security in 2019
	2019	China Education Modernization in 2035

It can be easily understood that China has put a lot of efforts on education informatization since 2000. In the first stage, Ministry of Education (MOE) in China made *the Action Plan for Invigorating Education Towards the 21st Century* in 1998 which clarifies that technology should be seen as the key of China's economy development in the 21st century, and it can also be the

power and solid foundation of social development. In order to win in global competition in terms of social and economy development, China is supposed to pay attention to the quality of education. To be specific, science, technology and innovation cannot be ignored during the process. Moreover, education should always be the strategic point of both economic and political landscape and takes the priority. Later, MOE (1999) came up with an idea that China should attach importance to the education modernization in terms of educational technology and ICT application in education in *Decisions on Deepening Education Reform and Promoting Quality Education*.

In the Second phase which was from 2000 to 2010, MOE (2000) started to implement the project of *Campus Access to ICTs* which was aimed to achieve a goal that 90% of primary and secondary schools would have accesses to Internet in the next five to ten years. And all students and instructors in primary and secondary schools can take advantage of online educational resources, and teaching quality would be increased via systematic personnel teaching training. In the *National Conference about ICT in Education in Primary and Secondary School*, education secretary, Chen Zhili (2000), stated that people have to understand the significant role of ICTs in school, which means China should quicken its pace of spreading ICTs in primary and secondary schools. A series of guidelines of education informatization were announced during this conference. MOE (2002) announced *The Tenth Five-Year Plan for Educational Technology* that focused on the development of E-learning across the country on the basis of the construction and development of China Education Research Network (CERNET) and the China Education Broadband Satellite Transmission Network (CEBsat) which offer a scientific and technological foundation of distant education. MOE (2003) started a project of *Modern Long-Distance Education in Rural Primary and Secondary Schools* which set up a goal that all primary and

secondary schools in rural area can have teaching discs and related devices and are equipped with satellite multimedia and computer room, which in general forms an atmosphere of education informatization and builds sharing system of educational resources in rural area. In *2003–2007 Action Plan for Invigorating Education*, MOE (2004) put forward an idea that China is supposed to quicken the pace of education informatization by improving the quality of related internet infrastructure, educational resources and personnel training on the basis of the development of CERNET and CEBsat.

In 2006, the State Council of China (SCC) made the *National Plan for Medium and Long Term Scientific and Technological Development (2006–2020)* and *The State Informatization Development Strategy (2006–2020)*. The former one "made plan and layout for keynote fields and the priority, proposing to develop information technologies represented by smart sensing technology, Ad Hoc network technology and virtualized real-world technology" (Huang & Price, 2016). *The State Informatization Development Strategy (2006–2020)* focused on the development of ICT related resources, the application of Internet media, and how to narrow the regional digital gap down. For the Eleventh Five-Year Plan for National Education Development, MOE (2007) emphasized "modern education system" and "learning community" via speeding up education modernization on the basis of educational information technology. In fact, the term "learning community" was firstly created and mentioned in an official document.

In the third phase, SCC (2010) made *National Outline for Medium and Long-term Educational Reform and Development (2010–2020)* which addressed that information technology has revolutionary effects on education development. Also, the plan emphasized that China has to speed up ICT development in education. To be specific, China will realize education modernization and basically form learning community by 2020, which will make

China a country rich in human resources. There was a *Ten-Year Development Plan of Educational Informatization (2011-2020)* made by MOE (2012) that every student has access to ICT infrastructure in the learning community. Also, there will be the broadband coverage for all different-levels schools. By the year 2020, China will have a modern educational technology system which is line with the standard in the developed countries. In National ICT in Education Work Video Conference (2012), Liu Yandong, the State Councilor at that time, stated that the project of *Three Connections & Two Platforms* is the key and core task for education informatization in the next few years. *Three Connections & Two Platforms* refers to every school and people's access to broadband network, quality educational resources, the online study space, educational management and educational resources. MOE (2012) announced *The Twelfth Five-Year Plan for National Education Development* which addressed the revolutionary role of education for education modernization and the comprehensive development of people. As for the goal, China will realize education modernization and basically form learning community by 2020, which will pave the way for China to be a modern country with rich human resources.

MOE (2016) made *The Thirteenth Five-Year Plan for Educational Technology* which has four key tasks. The first task is to finish the project of *Three Connections & Two Platforms*. The second task is to achieve a coordinated development of public and educational service platform that will help schools to improve the ability of educational management. The third task is about achieving educational equality and the quality of education. The fourth task is about exploring the way of digital educational resources construction and sharing. Later, SCC (2017) announced *The Thirteenth Five-Year Plan for National Education Development* that is aimed to achieve more significant progress during the process of education informatization, which will make China a country with well-rounded and quality talents. Also, there is a perspective that China

will achieve education modernization by the year 2030.

In the current stage of education informatization since 2018, MOE (2018) made *Education Informatization 2.0 Action Plan* that aims to make all instructors have ICT related teaching applications; all students have accesses to ICT related learning applications; all schools are with digital campus. Also, it should be noticed that both instructors and students should pay attention to the "digital competence" and "media and information literacy", which also can be seen as a required step for lifelong learning community. Besides, there are annual reports, *Key Work Points of Education Informatization* made by MOE from 2014 to 2019. Basically, here are four key points for work every year. The first is about construction of network infrastructure in terms of broadband Internet access, broadband speeds and teaching multimedia facilities, especially for schools in rural area. The second point is about the construction of online study space and digital resources sharing platforms, which is seen as the new and effective model of learning. The third point is about the personnel training of people who involved into the process of education informatization, including government officials, instructors, and school administrators. The fourth point refers to network security which is especially the key work point in 2018 and 2019.

SCC (2019) announced *Education Modernization in 2035* that the developmental goal of thirteenth five-year plan that education quality and related international influences will be enhanced will be realized by the end of 2020, which can be seen a significant milestone of education modernization in China. On the basis of this great foundation, China will embrace education modernization in 2035.

4.2 The features of education informatization in China

Based on the introduction of some key policies and projects above, it can be easily

understood that education informatization in China mainly focuses on four points, including education infrastructure construction, digital educational resources, ICT application in class and personnel training.

For the first three points, there are the project of CERNET, CEBsat, *Modern Long-Distance Education in Rural Primary and Secondary Schools*, *Three Connections & Two Platforms*, CERNET and CEBsat that can be regarded as the scientific and technological foundation of distant education, which creates a modern and advanced internet and satellite transmission network for online learning. *Modern Long-Distance Education in Rural Primary and Secondary Schools Project* started in 2013 and finished in 2007. Acoording to MOE (2007), through the five years, three instruction models were established in schools in rural areas. The first model is related to the application of multimedia CD-ROMs distributed to schools that are related to the eleven subjects in junior high schools and seven subjects in elementary schools, which assists instructors' traditional teaching in class. The second model is based on CEBsat that transmits free educational resources to school in rural area every week. The third model refers to students' information literacy which would be enhanced by information and technology class in school.

According to MOE (2007), by the end of 2006, the number of computers in schools in rural area increased from 1.46 million to 3.056 million. For elementary schools in rural area, every 98 people had one computer in 2002, while in 2006, every 39 people had one computer on average. For junior high schools in rural area, every 49 people had one computer in 2002, while in 2006, every 19 people had one computer on average. MOE (2007) stated that the investment on the distant education project would be more than 11.1 billion including 5 billion from central government and 6.1 billion from local governments, which is 1.1 billion more than the budget by

the end of 2007. The project covered 78% schools in the Midwest. For the project of *Three Connections & Two Platforms*, it quickens the process of all campuses into internet. More hardware, the likes of electric whiteboard, PC, tablet PC and some other multimedia equipment, has been equipped into class, which is the very step of education modernization. There are also some online educational sharing space or platforms established during the process.

For the personnel training, China has paid attention to instructor's information literacy and teaching quality. For example, in the *National Outline for Medium and Long-term Educational Reform and Development*, SCC (2010) announced that improving the instructors' ability of applying new ICT into class is the key to quicken education informatization process in China. MOE (2014) announced *the Standard of Training Class on Instructors' ICT Application Ability in Primary and Secondary Schools*. In the same year, MOE (2014) started a project called *One teacher, one high quality class* which was aimed to improve the class quality on campus. *Education Informatization 2.0 Action Plan*, MOE (2018) attached the importance on "digital competence" and "media and information literacy" of instructors. Moreover, there are also various systematic and thematic training on ICT, technology literacy, management ability for instructors and the leaders of education department at all levels.

During the process of education informatization, there is a great cooperation between central government, local government and corporations. At first, central government leads the way and makes the policy or ICT related projects which needs to be promoted across the country. Then local governments start to implement the plan on the basis of certain situation in area. Faced with limited supports and budget from central government, local governments normally absorb social investments which means cooperation with corporates. For example, in order to quicken the process of education informatization in China which is also the key idea of

National Outline for Medium and Long-term Educational Reform and Development (2010–2020), various experimental projects were launched in every province, including general experimental projects in one area, experimental projects in 1000 primary and secondary schools, experimental projects in 500 vocational schools, experimental projects in 100 universities and 60 special projects across country (MOE, 2012). Experimental projects in different regions can be seen as the significant try on projects promoted by central government since they will testify and be adjusted to local conditions to see whether the plans or projects from central government are effective or not. Another example refers to the notification from MOE working group which is dealing with Coronavirus Disease 2019 (COVID-19) issue in China. Due to the severe conditions of COVID-19 in China, all schools stop the regular off-line teaching models and start online teaching. As for new notification from MOE (2020), it is addressed that CERNET and three telecommunication operation enterprises, including China Mobile, China Unicom and China Telecom, should cooperate together to guarantee a fast and stable internet for online education. Also, government encourages enterprises to provide related online educational products and services to some regions which are deeply affected by COVID-19.

Overall, China has made significant achievements in the development of education system during the process of education informatization. The following are the tables of national educational situation from National Bureau of Statistics of China (NBSC). As is shown in Table 4.2, the number of schools of higher education, secondary vocational education, special education and preschool education have generally increased in the past 40 years. For regular senior secondary school, junior secondary school, vocational junior secondary school and regular primary school, their number have decreased in comparison with the number in 1978, which can be known form table 4.3. The main reason is that there was an education reform from 1997 to

2010 which was aimed to perfect compulsory educational resources to improve the quality of education, especially in rural area, which means a number of schools were consolidated. Expect vocational junior secondary schools, the number of teachers of other levels has generally increased in the past 40 years, which means there is comparably a stronger teaching power in education system. Also, as it shown in the table 4.4, student-teacher ratio has decreased gradually, which means one student can comparably have more attention from instructors. From table 4.5, it can be known the net enrolment ratio of school-age children in primary schools is 100% in 2018. And promotion rate of graduates of regular schools are over 95%.

Table 4.2 Number of schools by type and level, adapted from China Statistical Book 2019

(unit)

Year	Regular HEIs	Specialized Courses	Regular Senior Secondary Schools	Secondary Vocational Education	Junior Secondary Schools	Vocational Junior Secondary Schools	Regular Primary Schools	Special Education Schools	Pre-school Education Institutions
1978	598		49215	2760	113130		949323	292	163952
1980	675		31300	3459	87077		917316	292	170419
1985	1016		17318	14190	77529	1626	832309	375	172262
1990	1075		15678	20763	73462	1509	766072	746	172322
1995	1054		13991	22072	68564	1535	668685	1379	180438
2000	1041	442	14564	19727	63898	1194	553622	1539	175836
2001	1225	628	14907	17580	66590	1065	491273	1531	111706
2002	1396	767	15406	15919	65645	984	456903	1540	111752
2003	1552	908	15779	14682	64730	1019	425846	1551	116390
2004	1731	1047	15998	14454	63757	697	394183	1560	117899
2005	1792	1091	16092	14466	62486	601	366213	1593	124402
2006	1867	1147	16153	14693	60885	335	341639	1605	130495
2007	1908	1168	15681	14832	59384	275	320061	1618	129086
2008	2263	1184	15206	14847	57914	213	300854	1640	133722
2009	2305	1215	14607	14388	56320	153	280184	1672	138209
2010	2358	1246	14058	13862	54890	67	257410	1706	150420
2011	2409	1280	13688	13083	54117	54	241249	1767	166750
2012	2442	1297	13509	12654	53216	49	228585	1853	181251
2013	2491	1321	13352	12262	52804	40	213529	1933	198553
2014	2529	1327	13253	11878	52623	26	201377	2000	209881
2015	2560	1341	13240	11202	52405	22	190525	2053	223683
2016	2596	1359	13383	10893	52118	16	177633	2080	239812
2017	2631	1388	13555	10671	51894	15	167009	2107	254950
2018	2663	1418	13737	10229	51982	11	161811	2152	266677

Table 4.3 Number of full teachers of schools by type and level, adapted from China Statistical Book 2019

(10 000 persons)

Year	Regular HEIs	Specialized Courses	Regular Senior Secondary Schools	Secondary Vocational Education	Junior Secondary Schools	Vocational Junior Secondary Schools	Regular Primary Schools	Special Education Schools	Pre-school Education Institutions
1978	20.6		74.1	9.9	244.1		522.6	0.4	27.8
1980	24.7		57.1	13.3	244.9		549.9	0.5	41.1
1985	34.4		49.2	35.5	216.0		537.7	0.7	55.0
1990	39.5		56.2	66.3	249.9	2.9	558.2	1.4	75.0
1995	40.1		55.1	74.0	282.1	3.7	566.4	2.5	87.5
2000	46.3	8.7	75.7	79.7	328.7	3.8	586.0	3.2	85.6
2001	53.2	12.4	84.0	73.8	338.6	3.7	579.8	2.9	54.6
2002	61.8	15.6	94.6	69.1	346.8	3.7	577.9	3.0	57.1
2003	72.5	19.7	107.1	71.3	349.8	3.1	570.3	3.0	61.3
2004	85.8	23.8	119.1	73.6	350.0	2.4	562.9	3.1	65.6
2005	96.6	26.8	129.9	75.0	349.2	2.0	559.2	3.2	72.2
2006	107.6	31.6	138.7	79.9	347.5	1.2	558.8	3.3	77.6
2007	116.8	35.5	144.3	85.9	347.3	0.9	561.3	3.5	82.7
2008	123.7	37.7	147.6	89.5	347.6	0.7	562.2	3.6	89.9
2009	129.5	39.5	149.3	86.7	351.8	0.5	563.3	3.8	98.6
2010	134.3	40.4	151.8	87.1	352.5	0.2	561.7	4.0	114.4
2011	139.3	41.3	155.7	88.1	352.5	0.2	560.5	4.1	131.6
2012	144.0	41.3	159.5	88.0	350.4	0.2	558.5	4.4	147.9
2013	149.7	43.7	162.9	86.8	348.1	0.1	558.5	4.6	166.3
2014	153.5	43.8	166.3	85.8	348.8	0.1	563.4	4.8	184.4
2015	157.3	45.5	169.5	84.4	347.6	0.1	568.5	5.0	205.1
2016	160.2	46.7	173.3	84.0	348.8		578.9	5.3	223.2
2017	163.3	48.2	177.4	83.9	354.9		594.5	5.6	243.2
2018	167.3	49.8	181.3	83.4	363.9		609.2	5.9	258.1

Table 4.4 Student-teacher ratio by level of regular schools, adapted from China Statistical Book 2019

(Number of Teachers=1)

Year / Region	Primary School	Junior Secondary School	Regular Senior Secondary School	Secondary Vocational School	Regular Institution of Higher Education
2005	19.43	17.80	18.54	21.34	16.85
2006	19.17	17.15	18.13	22.65	17.93
2007	18.82	16.52	17.48	23.13	17.28
2008	18.38	16.07	16.78	23.32	17.23
2009	17.88	15.47	16.30	25.27	17.27
2010	17.70	14.98	15.99	25.69	17.33
2011	17.71	14.38	15.77	24.97	17.42
2012	17.36	13.59	15.47	24.19	17.52
2013	16.76	12.76	14.95	22.97	17.53
2014	16.78	12.57	14.44	21.34	17.68
2015	17.05	12.41	14.01	20.47	17.73
2016	17.12	12.41	13.65	19.84	17.07
2017	16.98	12.52	13.39	18.98	17.52
2018	16.97	12.79	13.10	19.10	17.56

Table 4.5 Net enrolment ratio and promotion rate, adapted from China Statistical Book 2019

Year	Net Enrollment Ratio of School-age Children in Primary Schools	Promotion Rate from Primary Schools to Junior Secondary Schools	Promotion Rate from Junior Secondary Schools to Senior Secondary Schools
1990	97.8	74.6	40.6
1991	97.9	77.7	42.6
1992	97.2	79.7	43.6
1993	97.7	81.8	44.1
1994	98.4	86.6	47.8
1995	98.5	90.8	50.3
1996	98.8	92.6	49.8
1997	98.9	93.7	51.5
1998	98.9	94.3	50.7
1999	99.1	94.4	50.0
2000	99.1	94.9	51.2
2001	99.1	95.5	52.9
2002	98.6	97.0	58.3
2003	98.7	97.9	59.6
2004	98.9	98.1	63.8
2005	99.2	98.4	69.7
2006	99.3	100.0	75.7
2007	99.5	99.9	80.5
2008	99.5	99.7	82.1
2009	99.4	99.1	85.6
2010	99.7	98.7	87.5
2011	99.8	98.3	88.9
2012	99.9	98.3	88.4
2013	99.7	98.3	91.2
2014	99.8	98.0	95.1
2015	99.9	98.2	94.1
2016	99.9	98.7	93.7
2017	99.9	98.8	94.9
2018	100.0	99.1	95.2

a) Enrolment ratio of school-age children before 1991 was calculated on the basis of primary school pupils aged 7-11 enrolled. From 1991 onwards its calculation has taken account of the age of entry and the length of schooling prevailing.

4.3 Discussion

Since Reform and Opening Up policy started in 1978, China has accumulated great experience in ICT industry and built significant capacity in related industrial sectors. As shown in Table 4.6, the capacity of telecommunication has significantly been enhanced in the past 39 years. For developments of mobile telephone exchanges, base station of mobile telephones and optical cable lines, there were no foundation projects and construction experiences. Faced with the lack of experiences and infrastructure in the field, China has put a lot of efforts on the development of telecommunication industry by taking advantages of national policies that supports the industry. In terms of Internet in China, as depicted in Table 4.7, it can be seen that with the lack of infrastructure in the 1990s, China has achieved rapid and great development of Internet step by step. The increasing number of domain names, websites, webpages broadband subscribers indicate that the market of internet related industry has been expanded and enlarged. As depicted in Table 4.7, it cannot be ignored that the there is a large group of mobile internet subscribers since 4G commination network has been applied into daily life since 2014. As for the subscribers in urban and rural area from 2010 to 2017, the subscribers in rural area increased 278.8%, while the growth rate in urban area is 155.7%. However, the number of subscribers in urban area is always more than that in rural areas, which in some ways, can be considered as new digital divide that will be discussed later in this chapter. As shown in Table 4.8, it can be known that the development of telecommunication and Internet have boosted that of software and information technology industry which can be regarded as a new related ICT industry providing advanced ICT products and services to market.

Table 4.6 Main communication capacity of telecommunications, adapted from China Statistical Book 2019

Year Region	Capacity of Long-distance Telephone Exchanges (circuit)	Capacity of Office Telephone Exchanges (10 000 lines)	Capacity of Mobile Telephone Exchanges (10 000 subscribers)	Base Stations of Mobile Telephones (10 000)	Length of Optical Cable Lines (km)	Length of Long Distance Optical Cable Lines
1978	1863	405.9				
1980	1969	443.2				
1985	11522	613.4				
1990	161370	1231.8	5.1			3334
1995	3518781	7203.6	796.7			106882
2000	5635498	17825.6	13985.6		1212358	286642
2005	13716307	47196.1	48241.7	28.1	4072788	723040
2006	14423427	50279.9	61032.0	35.7	4279559	722439
2007	17092213	51034.6	85496.1	45.9	5777289	792154
2008	16907188	50863.2	114531.4	59.7	6778496	797979
2009	16849027	49265.6	144084.7	111.9	8294565	831011
2010	16414644	46537.3	150284.9	139.8	9962467	818133
2011	16023432	43428.4	171636.0	175.2	12119303	842341
2012	15797426	43749.3	184023.8	206.6	14793300	868175
2013	12805074	41089.3	196557.3	241.0	17453709	890018
2014	9829082	40517.1	205024.9	350.8	20612529	928398
2015	8110825	26446.5	218150.0	465.6	24863348	965283
2016	6810778	22441.6	218540.0	559.4	30420755	994092
2017	6035297	18398.7	242185.8	618.7	37801073	1044998

Table 4.7 Main indicators on Internet development, adapted from China Statistical Book 2019

Year / Region	Number of Domain Names (10 000 units)	Number of Websites (10 000 sites)	Number of Webpages (10 000 pages)	IPv4 Addresses (10 000)	Broad Band Subscribers Port of Internet (10 000 ports)	Dial-up Subscribers of Internet (10 000 subscribers)	Mobile Internet Subscribers (10 000 subscribers)	Flow Accessed to Mobile Internet (10 000 G)	Broadband Subscribers of Internet (10 000 subscribers)	Urban Broadband Subscribers	Rural Broadband Subscribers	Household Broadband Subscribers	Institution Broadband Subscribers
1995						0.7							
2000		26.5				900.5							
2005	259.2	69.4		7439.1	4874.7	3559.5			3735.0				
2006	410.9	84.3	447257.8	9801.6	6486.4	2644.6			5085.3				
2007	1193.1	150.4	847108.5	13527.5	8539.3	1941.0			6641.4				
2008	1682.6	287.8	1608637.0	18127.3	10890.4	1227.8			8287.9				
2009	1681.8	323.2	3360173.2	23244.6	13835.7	754.4			10397.8				
2010	865.6	190.8	6000806.0	27763.7	18781.1	590.1			12629.1	9963.5	2475.7		
2011	774.8	229.6	8658229.8	33044.0	23239.4	550.7			15000.1	11691.4	3308.8		
2012	1341.2	268.1	12274681.7	33053.5	32108.4	569.8			17518.3	13442.4	4075.9		
2013	1843.6	320.2	15004076.3	33030.8	35945.3	485.1			18890.9	14153.6	4737.3		
2014	2059.6	334.9	18991864.9	33198.8	40546.1	441.6	87522.1	206193.6	20048.3	15174.6	4873.7	16333.6	3714.8
2015	3101.4	422.9	21229622.4	33652.0	57709.4	331.6	96447.2	418753.3	25946.6	19547.2	6398.4	21716.4	4230.2
2016	4227.6	482.4	23599758.4	33810.3	71276.9	306.3	109395.0	937863.5	29720.7	22266.6	7454.0	24926.8	4793.9
2017	3848.0	533.3	26039903.0	33870.5	77599.1	301.7	127153.7	2459380.3	34854.0	25476.7	9377.3	29552.2	5301.8

Table 4.8 Main indicators of software and information technology services, adapted from China Statistical Book 2019

Year / Region	Software Income (10 000 yuan)	Software Products Income	Income from IT Service	Embedded System and Software Income	Software Export (10 000 USD)
2010	135885509.6	49305319.5	65296861.8	21283328.4	2673526.0
2011	188489906.0	61921545.6	95830650.1	30737710.2	3461947.0
2012	247937523.5	78572418.6	129448959.2	39916145.7	3942380.0
2013	305874743.1	98768380.6	160305341.0	46801021.5	4691377.0
2014	370264197.3	121984961.7	187110900.5	61168335.2	4867057.8
2015	428479158.8	136561431.9	222109513.9	69808213.0	4948702.5
2016	482322235.0	150278252.4	260904232.5	71139750.1	4994607.7
2017	551031186.6	169835724.7	306037090.4	75158371.5	5411643.3

For educational informatization, it benefits from the development of ICT economy which provides infrastructure, educational products and services during the process. Also, as shown in Table 4.9, educational funds, especially funds from government play an importance role which brings tons of investments during the process, which boosts ICT related industries at the same time. It should be noticed from Table 4.9 that educational funds are mainly from government and external social donations. Also, the increasing governmental funds indicate the increasing national incentive to education development in ICT era. It can be observed that the amount of funds from central government exceeds that from local governments. This matches one of the features of education informatization discussed in the former chapter that education informatization in China is central government led and local governments assisted with the efforts from corporations.

Table 4.9 Basic statistics on educational funds, adapted from China Statistical Book 2019

(10 000 yuan)

Year Region	Total	Government Appropriation for Education	Public Expenditure on Education	Funds from Runners of Private Schools	Donations and Fund-raising for Running Schools	Income from Teaching Research and Other Auxiliary Activity	Tuition and Miscel-laneous Fees	Other Educational Funds
1992	8670491	7287506	5649364		696285		439319	
1995	18779501	14115233	10929473	203672	1628414		2012422	
2000	38490806	25626056	21917652	858537	1139557	9382717	5948304	1483939
2001	46376626	30570100	27056548	1280895	1128852	11575137	7456014	1821643
2002	54800278	34914048	32549425	1725549	1272791	14609169	9227792	2278722
2003	62082653	38506237	36190977	2590148	1045927	17218399	11214985	2721943
2004	72425989	44658575	42444209	3478529	934204	20114268	13465517	3240414
2005	84188390	51610759	49460379	4522185	931613	23399991	15530545	3723842
2006	98153086	63483648	61353481	5490583	899078	24073042	15523301	4206736
2007	121480663	82802142	80943369	809337	930584	31772357	21309082	5166242
2008	145007374	104496296	102129675	698479	1026663	33670711	23492983	5115225
2009	165027065	122310935	119749753	749829	1254990	35275939	25155983	5435371
2010	195618471	146700670	141639029	1054254	1078839	41060664	30155593	5724045
2011	238692936	185867009	178217380	1119320	1118675	44246927	33169742	6341005
2012	286553052	231475698	203141685	1281753	956919	46198404	35048301	6640278
2013	303647182	244882177	214056715	1474089	855444	49262087	37376869	7173384
2014	328064609	264205820	225760099	1313476	796700	54271581	40530393	7477031
2015	361291927	292214511	258618740	1876620	869960	58097239	43173611	8233597
2016	388883850	313962519	277006325	2032733	810447	62768292	47709339	9309860
Central Government	36227666	25351988	14883286		314724	8138797	2846879	2422158
Local Governments	352656184	288610531	262123039	2032733	495724	54629494	44862461	6887702

There is a huge market of educational products and services on campus on the basis of well-established ICT infrastructures and inclined policies from government at all levels. Table 4.10 shows classifications of educational products which can be divided into hardware products and software products. Hardware mainly includes electronic white board, multimedia devices and class recording devices. For software products, utilities products can be applied into campus for security, teaching administration, exam assessment system and communication with family. Subject tutoring projects are related to some applications which students can benefit from during their learning processes. As it is shown in Table 4.11, there is a huge market of educational products and services since there are various supportive policies during the era of education informatization. The number of enterprises in the industry has been increasing generally. Compared the number of enterprises in 2013, that in 2018 is up to 5544. It cannot be ignored that the scales of e-commerce have extended significantly at the same time. The e-commerce scales in 2018 is 14.2 times than that in 2013. Combined with policies supportive of education informatization development, the development of ICT industry can be considered as a solid foundation of education informatization in China. In this situation, there are various projects of infrastructure construction, teaching devices, campus related services, personnel training, which at the same time, boosts the development of ICT and education industry as well.

Table 4.10 The classifications of educational products

Hardware:	electronic white board, multimedia devices, recording devices, etc.	
Software:	utilities	online management platform
		online campus service application
	subject tutoring project	

Table 4.11 Informatization and e-commerce of enterprises in education industry, adapted from China Statistical Book 2014-2019

Year	Number of enterprises (unit)	Computers used at the end of period (unit)	Computers used per 100 persons (unit)	Websites of enterprises (unit)	Websites per 100 enterprises (unit)	Enterprises (unit) with e-commerce transactions	Scales of e-commerce (100 million yuan)	Purchases of e-commerce (100 million yuan)
2013	2739	245636	76	1849	68	71	9.4	0.2
2014	3623	374674	84	2525	70	120	17.8	0.4
2015	4362	459754	93	2895	66	275	20.8	1.1
2016	4986	531213	91	3265	66	364	29.7	1.2
2017	5583	657453	93	3701	66	338	69.1	2.6
2018	5544	793532	102	3814	69	383	133.3	3.2

Moreover, when it comes the digital divide, many people think that students now in urban and rural area can have equal accesses to Internet because broadband connectivity and speed have improved a lot in various infrastructure construction projects during education informatization. From Figure 4.1, it can be known that the number of netizens in urban areas is much more than that in rural areas even though broadband condition has been improved a lot in rural areas so that people comparably have more accesses to Internet. Considering education informatization in rural areas, it can be referred that technology development is not determinate and cannot truly narrow down the gap between regions because how to apply technology into rural areas and how people there accept it are actually the essence of the whole progress.

Here are reasons for the different developing levels on economy and education in urban and rural areas. First, students in developed regions comparably receive more information from outside world because they know more about how to take advantage of technology. Technology related products and services are still new to students in rural areas even though tons of advanced equipment were set up there. Second, there are less educated people in rural areas. Therefore, faced with plenty of advanced educational products and services, there is still a barrier for teachers as well as parents to reach, which means the effectiveness of ICT application is not

obvious and significant. Third, it usually takes a long time for people to improve their information literacy, even though technology is applied significantly in one area.

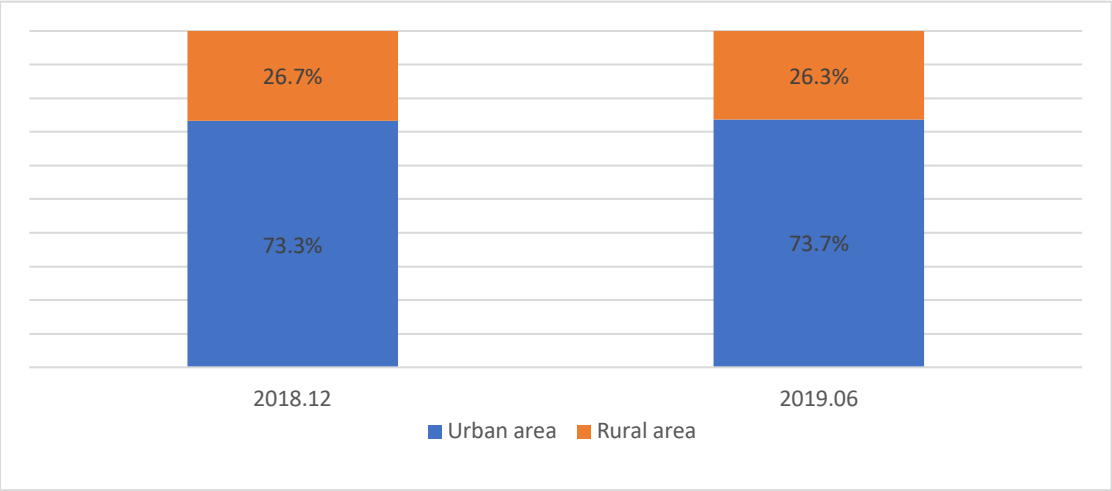

Figure 4.1 Netizens in urban and rural area, adapted from the 44th China Statistical Report on Internet Development

CHAPTER 5

CONCLUSION

Education informatization in China is a systematic and complex project which is related to education modernization that guides China, a country rich in high quality human resources. There are four phases of education in China. The first one was from 1978 to 1999 during which people attached the importance to high quality education. There were *Action Plan for Invigorating Education Towards the 21st Century* and *Decisions on Deepening Education Reform and Promoting Quality Education*. The second phase started from 2000 to 2010 during which some foundational projects, including *Campus Access to ICT* and *Modern Long-Distance Education in Rural Primary and Secondary Schools*, CERNET and CEBsat, were brought into action. The latter two are the scientific and technological foundation of distant education. The third phase was from 2010 to 2017 during which Three Connections & Two Platforms, a key and essence project, which refers to accesses to broadband network, quality educational resources, the online study space study, educational management and educational resources on campus. Also, the idea of having well-rounded and quality talents was brought up as a goal for education modernization. The latest stage starts from 2018 when Education Informatization 2.0 Action Plan which addresses the quality and comprehensiveness of education informatization in China was made. In 2019, China Education Modernization in 2035 was made by SCC, which refers that education quality and related international influences will be enhanced by the end of 2020.

In the process of education informatization, China mainly focuses on four points, including education infrastructure construction, digital educational resources, ICT application in class and personnel training. The number of schools and teachers at all levels increases as well as the net enrollment and promotion rate of students. Those great achievements are related to a

developmental model that refers to cooperation between central government, local governments and corporations. Normally, central government leads the way and sets a goal. Then local governments implement plan based on its situation in area. Faced with limited budget, local governments normally absorb external investments which means the cooperation relationship with corporates.

The last two research questions are answered in this thesis. The answer of first one is that on the one hand, education informatization in China benefits from the development ICT industry which provides the scientific and technological foundation. On the other, education informatization boosts ICT economy and education industry because there is a large scale of commerce during the process than ever before. For the second one, the answer is that it is hard to admit that digital divide can be easily narrowed down by technology development since there is a significant difference of the percentage of netzines in urban and rural areas. It can be referred in the process of education informatization, there might be no significant difference in urban and rural areas in terms of infrastructure construction. However, how technology is accepted and the effectiveness of its application in rural areas are the key aspects that should be considered. In some ways, digital divide is still existing because of the comparably lower development level on economy and education in rural areas. It takes time for people to increase their awareness of media and information literacy.

The thesis attempts to investigate education information in China, through analyses of governmental policies and reports. More efforts should be made for related research in the future. First, in this thesis, the phases of education informatization started from 1978 and is divided into four parts. And only some key and significant projects and policies are analyzed. Perhaps, education informatization before 1978 should also be considered and more documents should be

interpreted and discussed to have a better and accurate understanding of education informatization in the future. Second, the thesis is on the basis of documentary research. More information should be collected and analyzed through other methods, including interviews, case studies, observation, survey and so on. As for the relationship between education informatization and the development of related industry, more obvious and direct data should be interpreted to understand industrial practices from different perspectives. Third, when it comes to digital divide, there should be more direct and first-hand data from rural areas on the deployment and effectiveness of ICT technology.

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