An Investigation into Application and Development of ICT in China General Higher Education and its Impact on the Traditional Librarians’ Roles in Learning Support:

A Case Study of Shanghai Tongji University

A study submitted in partial fulfillment of the requirements for the degree of Master of Science in Information Management at

THE UNIVERSITY of SHEFFIELD

by

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September 2005
Abstract

The ICT application in China general higher education is one of the most prominent issues to which the professionals in education field have paid much attention. This study aims to reveal the current situation of ICT application and development tendency in China general higher education as well as to identify the impact of ICT on China general higher education and the roles of librarians in learning support.

Both quantitative and qualitative approaches were adopted in this research that was inductive in nature. Through huge quantities of literature searching and reviews as well as the investigation of Shanghai Tongji University that acted as a case study, a clear picture has been obtained about the ICT application, its development trends and its impact on China education and the roles of librarians. Questionnaire survey was conducted in Shanghai Tongji University to collect factual data, while both semi-structured and unstructured interviews were used to gain attitudinal data and personal opinions of students and librarians.

The information attained from literature review and the analysis of data generated from the questionnaire and interviews reveals that ICT application in China general higher education has been tremendously developed and is still swiftly expanding, both in hardware and software. However, some problems such as regional gaps still exist. On the other hand, ICT application has brought a revolution to library use and more extra roles to librarians. Now a librarian also acts as a net navigator, educator/facilitator, online information evaluator and so on. Such changes will be further enlarged with the increasing degree of ICT application in library.

The results of this research don’t attempt to set any firm conclusions but to offer an insight into how ICT has been applied to China general higher education and its impact on China higher education and the roles of librarians from the perspectives of students, teachers and librarians.
Acknowledgements

Firstly, I’d like to give my sincere thanks to my dissertation supervisor, Dr. Mark Sanderson, for his time, insightful guide and encouragement throughout this dissertation research.

I am also grateful to my dear friends for their contributions to my questionnaire survey, and all the participants who accepted my interviews.

Finally, I’d like to acknowledge my family especially my beloved parents and my dear boyfriend for their support, understanding and inspiration during my whole course and in this research. Without their support and dedication, I would not have had such a chance to study in England and to finish this dissertation research.
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Chapter 1: Introduction

1.1 Introduction to ICT and ICT Education

Since the emergence of computers and the Internet, ICT (Information and Communication Technologies) has been tremendously developed via the expansion of networks. Especially in recent years, the step of ICT has become faster and more firmly than ever before so that it has not only exerted giant effect on such aspects as the global politics, economics and culture but also increasingly pervaded almost every aspect of our social life, including work, learning, health, entertainment, transport system, etc. ICT makes possible the merger of the computing, information, communications, entertainment, and mass media industries by providing a means of swiftly exchanging information in the digital format used by computers and the Internet. The fact is undeniable that this era has become an information era due to the drive of ICT.

As a significant part of the social system, education is faced with good opportunities of transformation as well as big challenges in this ‘informationisation’ society. Nowadays, ICT has been widely applied to education. Such application has gained particular attention from people all over the world for it is an especially strong power that has brought about the global education revolution. ICT is not only a tool or a method accessorrial to the traditional education but also a main force to promote the whole educational system further developed and leads to the profound changes in the goals, contents, forms and methods of the education and even the university structure. According to Hepp et al. (2004), many countries all over the world are now investing in ICT to improve the education quality and update the education content they provide their younger generations. They also introduced that the governments of such developed nations as Canada, the United Kingdom and the United States were deploying high bandwidth in schools and consistently promoting research on ICT use inside the classrooms for many different educational, cultural and social settings. In a
word, it is obvious that the integration of ICT and the traditional education is an inevitable tendency in educational system.

However, ICT in China higher education hasn’t developed as fast as those developed nations, although Li (2005) pointed out that the Chinese government had paid much attention to the process of introducing and integrating ICT application into the educational system, which was referred to as educational “informationisation”. The detailed situation of ICT application in China education will be examined in Chapter 2—literature review.

All in all, the problems about how to introduce ICT into learning and teaching effectively and efficiently and how to prepare relevant staff and students for ICT use have become the focus of all the professionals in education field around the world.

1.2 Research Context
This section aims at the wider social factors involved in the issue of ICT education. The overwhelming value of ICT in education is examined and the challenged traditional roles of librarians in learning support are introduced as well.

1.2.1 Value of ICT in Education
ICT is very important to the education for all the countries around the world. Hogg (2003) said that ICT industry was unlike any others in term of its dynamic nature and they couldn’t afford to sit back and let others set the standards for ICT education. He also believed that the nation’s future prosperity came from the “scientific, technical, managerial and entrepreneurial flair” of people, which could be fostered and encouraged by ICT education. Tony Blair also commented that ICT education had the biggest potential to impact the lives of British people in the years to come. Besides, Cabanatan (2002) pointed out that ICT education was a given in narrowing down the digital divide since it could help sharing educational resources in all
subjects and making distance education possible through a technology environment.

Hepp et al. (2004) introduced the value of ICT to the developed countries. See as follows:

- New skills for new society
- Productivity enhancement
- A quest for quality learning

As for the developing countries, Hepp et al. (2004) also mentioned that they had become worried about the widening gap between their reality and the aggressive ICT policies of countries such as the United State. Castells (2001) described this situation as follows:

“Developing countries are finding it increasingly difficult to compete with their present human resources in a global economy that regards information as an essential asset… within a dynamic global market. ICT plays a major role for dealing with information and its transformation into knowledge which is a basic requirement for citizens to become effective participants in this new scenario.” (Castells, 2001)

In a word, it is very urgent to improve the quality and equity of education to bridge the gap between developed and developing countries. ICT is regarded as the best tools for this purpose.

The whole world is fixing their eyes on ICT education for various purposes. Due to its valuable position in education, it is worthy of studying the application of ICT in China higher education.

1.2.2 Challenged Role of Librarians in Learning Support

After the emergence of ICT, it is argued that whether the library needs to exist any more if ICT is able to make everything that users require online. Management and staff in libraries are often asked whether the roles of libraries and librarians will or have shifted due to the ICT application in libraries, what their reactions are and how they adapt to such changes. Trying to find possible answers to these questions, my
study covers the impact of ICT on librarians’ roles as well.

1.2.3 Research Rationale
As my personal perspective is concerned, the reason that I chose ICT as my dissertation topic is that I found, after coming to UK for study, the remarkable gap between China and UK with regard to ICT application in education. Since ICT is highly valuable to China education, it is extremely necessary to reduce such gap. I wish that my research would be helpful in providing an insight in this field to those successive researchers.

1.2.4 Research Scope
This research aims at China general higher education that is offered by China’s conventional universities and colleges and only open to senior secondary schools graduates, but not the Chinese adult higher education that targets the working adults. Due to the limitations of research time and resources, the method of case study was adopted. The Shanghai Tongji University is selected as the objective of case study. Consequently, this research scope is within Shanghai Tongji University.

1.3 Aims and Objectives
The overall aim of this dissertation is to identify the present application and development tendency of ICT in China general higher education and to establish what impact it has brought to Chinese librarians’ roles in learning support.

To fulfill the overall aim, the detailed objectives of investigation are set, covering the following areas:

- To introduce the definition and technologies of ICT and ICT education.
- To specify the current situation of ICT application in China higher education.
- To identify the impact of ICT on China higher education.
- To study the changes in roles of librarians in learning support caused by the ICT
application in libraries.

- To study the development tendency of ICT in China higher education.

After this research is completed, it is possible to answer the following questions:
1. To what extent has ICT been applied in China higher education?
2. To what extent do Chinese students in higher education use ICT?
3. What are the attitudes of Chinese teachers and students towards ICT use in higher education?
4. What impact has ICT exerted on China higher education?
5. How have the roles of librarians been changed since the emergence of ICT in libraries?

Each specific objective together helps to provide a detailed and powerful insight to the overall aim.
Chapter 2: Literature Review

2.1 Concept of ICT and ICT Education

2.1.1 ICT

The expansion of acronym ICT is Information and Communication(s) Technology. UNESCO (2003) explained that ICT were the hardware and software that enabled the society to create, collect, consolidate and communicate information in multimedia formats for various purposes. Nevertheless, this definition does not define what type of hardware and software ICT encompasses.

Towers (2001) gave one detailed definition proposed by Nick Poole. Nick Poole, as an ICT advisor from Re: source, outlined the factors that composed the Information, Communication and Technology within the context of this term. It says:

“The information part covers… applications such as a library catalogue”, the “communications part refers to the various technologies that enable the transmission and receipt of that information between remote locations”, and “the technology part of ICT refers to the physical components… that such as a vehicle for this data.”

This definition has a detailed interpretation regarding the types of application ICT includes.

Another definition provided by New Opportunities Fund (2000) lists some typical facilities that are involved. It states that ICT is the combination of telecommunications, computing and broadcasting and covers any products that will store, retrieve, manipulate, transmit or receive information electronically, while the content of ICT may consist of computers, scanners, printers, bandwidth, information infrastructure, operation system, application tools, courseware, BBS, email, telephones, television, fax, and even local and wide area network including Internet.

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1 Towers (2001) asked Nick Poole for this definition of ICT via email during his research.
2.1.2 ICT Education

According to Liu (2002), the notion of ICT education was first proposed in the nineties of last century. Liu (2002) pointed out that in September of 1993, the Clinton’s government formally put forward the plan to build ‘National Information Infrastructure’ (NII) which was also named as ‘National Superhighway’. The core of NII was to develop the synthetic service system based on Internet and to promote the application of Information Technology (IT) into every field of the society, particularly the education field. Liu said that the American government regarded the application of IT in education as the most important method to conduct the education revolution in the 21st century.

Generally speaking, the ICT education in China is treated as the result of Educational ‘Informationisation’ which was defined by the Chinese government as the whole process of integrating ICT application into the educational system according to Li (2005). The main contents of Educational ‘Informationisation’ are composed of the following issues suggested by Liu (2002):

- The first issue is to establish a networked education environment which is digital and intellectualized.
- In such education environment, a new platform open to any users without limitation should be set up.
- All the resources of learning and teaching could be shared and exchanged on this platform.
- New instructional modes and rules will be generated and run on this platform.

Based on the above concepts, Liu (2002) proposed the definition of China ICT education. She said ICT education was to regard ICT as an essential factor in the educational system and to take full advantage of ICT in every field of the educational system in purpose of accelerating the education modernization.
2.2 Background of ICT Development in China Education

The ICT application in China higher education can cast back to 1994 when China Education and Research Network (CERNET) was set up. At the very beginning, CERNET developed rather slowly. Nevertheless, since 1999, the number of new students is tremendously growing due to the rapid expanding of China higher education which is the result of the policy to transform from Elite Higher Education to Mass Higher Education in China. Zhao (2003) pointed out that such expansion directly results to the development of ICT use in universities and colleges around China. A table was made by Zhao (2003) to illustrate the development of CERNET from 1994 to 2002. (See as follows).

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Amount of Higher Institutions that have Campus Network and Connected to CERNET</th>
<th>Percentage of China Higher Institutions (%)</th>
<th>Total Amount of Users in CERNET (Ten Thousand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>10</td>
<td>0.9</td>
<td>0.2</td>
</tr>
<tr>
<td>1995</td>
<td>108</td>
<td>10.2</td>
<td>3</td>
</tr>
<tr>
<td>1996</td>
<td>200</td>
<td>18.9</td>
<td>8</td>
</tr>
<tr>
<td>1997</td>
<td>344</td>
<td>32.6</td>
<td>20</td>
</tr>
<tr>
<td>1998</td>
<td>450</td>
<td>39.1</td>
<td>80</td>
</tr>
<tr>
<td>1999</td>
<td>550</td>
<td>53.8</td>
<td>200</td>
</tr>
<tr>
<td>2000</td>
<td>800</td>
<td>74.6</td>
<td>500</td>
</tr>
<tr>
<td>2001</td>
<td>895</td>
<td>83.5</td>
<td>747</td>
</tr>
<tr>
<td>2002</td>
<td>932</td>
<td>92.1</td>
<td>800</td>
</tr>
</tbody>
</table>

From the table, it is amazing to discover that the speed of CERNET development is extremely rapid. The figures of 2002 are almost as 100 times big as those of 1994.

In 1999, four China universities found the first group of On-line Education School (OES) and at the same year began recruiting students around China. According to Zhao (2003), OES was later treated as the prototype of ICT application in China universities. He also described the development process of OES in the following table.
Table 2.2—the Development of OES from 1999 to 2002 in China

<table>
<thead>
<tr>
<th>Year</th>
<th>The number of China Universities that Founded OES</th>
<th>The Total Amount of Enrollment Student in OES (Ten Thousand)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>2000</td>
<td>31</td>
<td>4</td>
</tr>
<tr>
<td>2001</td>
<td>45</td>
<td>23</td>
</tr>
<tr>
<td>2002</td>
<td>67</td>
<td>60</td>
</tr>
</tbody>
</table>

In 2000, Chinese Education Department enacted a notice to publish a document ‘Guideline of ICT education for primary and high schools’, which represents the formal start of Chinese Educational ‘Informationisation’. This guide normalized the contents of the courses in ICT education. Guo et al. (2001) classified the contents into the following subjects according to the guideline:

- Basic knowledge about computers
- Information communication and exchange
- Use of resources
- Comprehensive utilization
- Software design and implementation
- Juristic consciousness
- Expansible ability

Since then, the ICT education in China has gradually become systematic and normalized.

As far as the ICT infrastructure is concerned, it has been constructed step by step with the development of CERNET and OES. Till 2002, considerable achievements have been obtained in the construction of ICT infrastructure. Zhao (2003) studied the ICT infrastructure of Chinese universities and colleges in 2002. The results are shown as follows:
Table 2.3—ICT Infrastructure of China Universities and Colleges (2002)

<table>
<thead>
<tr>
<th>The Conditions of ICT Facilities in China Higher Institutions (%)</th>
<th>All Institutions</th>
<th>Ministry University &amp; College</th>
<th>Province University &amp; College</th>
<th>Community College</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of Faculty Offices Connected to Network (%)</td>
<td>81.6</td>
<td>84.9</td>
<td>81.0</td>
<td>81.1</td>
</tr>
<tr>
<td>Percentage of Classrooms Connected to Network (%)</td>
<td>41.1</td>
<td>40.9</td>
<td>41.8</td>
<td>39.3</td>
</tr>
<tr>
<td>Percentage of Classrooms with Fixed LCD Projector (%)</td>
<td>19.2</td>
<td>20.3</td>
<td>21.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Percentage of Dormitories Connected to Network (%)</td>
<td>36.0</td>
<td>47.5</td>
<td>35.1</td>
<td>32.4</td>
</tr>
<tr>
<td>Percentage of Institutions had Wireless LAN (%)</td>
<td>3.6</td>
<td>4.2</td>
<td>3.0</td>
<td>1.3</td>
</tr>
</tbody>
</table>

2.3 Goals & Policies of ICT Application in China Education

2.3.1 Introduction

At present, almost all the countries have set their policies and goals for ICT education in order to systematically develop ICT application in educational system. The Chinese government believes that the modernization of education requires applying ICT in order to make students competitive in the information era. As a result, it has established some relevant detailed goals and policies for ICT application in China education as well as its corresponding main tasks, which will be introduced in this sector.

2.3.2 Goals

Li (2005) summed up the Chinese government’s long-term goals for Chinese Educational ‘Informationisation’ by 2010 as follows:

- ICT infrastructure covering the whole country will be set up.
- ICT education will be popularized in most areas.
- The ability of ICT application for all Chinese citizens will be enhanced.
- Enough ICT specialists will exist to meet social development demands.
A lifelong educational system will be built up.

Software producing centers and ICT corporations will be operational.

The general level of ICT infrastructure and application in education will rank at the top level among developing countries.

For universities in the developed area of China, the level of ICT infrastructure and application will catch up with that of some developed countries.

Until now, the majority of these goals have been achieved in some central cities in China, but unfortunately not in some rural areas.

2.3.3 Main Tasks and Policies

In order to have long lasting effects and to effectively infuse ICT into the educational system, Hepp et al. (2004) thought that ICT policies should not be designed in isolation, but be part of a more comprehensive effort towards improving the equity and quality of an educational system. Li (2005) suggested that the Chinese government had established some policies to realize these above goals:

- Broaden the bandwidth of the main China educational lines and CERNET, expand coverage towards the West and small cites.
- Improve the province and city network to supply high quality services to all kinds of education institutes with 2.5 Gbps bandwidth.
- Set up a broadband satellite-based network (CEBsat) and connect it to the Internet.
- Promote the construction of university campus network, particularly in the western parts of China, and develop a digital information platform to support e-libraries, information management systems and distance educational system.
- Strengthen educational administration informationisation by building platforms for officials.
- Increase the number and quality of ICT specialists to spread ICT education in high schools as well as universities and to improve the information literacy of teachers.
- Share learning and teaching resources by constructing a distributed education
resource platform.

- Set policies about education enterprises to encourage more financial investment and the development of ICT corporations.
- Develop the standards for the quality of education informationisation and apply them to build evaluation systems.

### 2.4 Current ICT Level in China Education

#### 2.4.1 Main Achievements to Date

Li (2005) summed up today’s major achievements of ICT application in China education. The main points are:

1. The construction of infrastructure for educational informationisation is rapidly proceeding. CERNET offers basic support for scientific research and distance education and has become the second largest network in China, covering 30 cities.
2. The ICT application in China education is expanding swiftly, which is positively promoted by the support of social enterprises and the development of educational resources. About 70% of all the colleges have built campus network.
3. The development of educational resource and the modern distance education experiment have made some progress. Many education administration departments have developed educational resource warehouses for materials including web-based courses and other courseware.
4. The online-education school (OES) has been steadily developed and is far more prosperous at present by contrast with the situation at its birth in 1999.

In short, considerable progress has been achieved in both the hardware side and the software side of the ICT application in China educational system.

#### 2.4.2 Regional Difference

However, it is absolutely impossible to attain the same progress and achievements in every area around China at the moment because of the regional gap in terms of the
culture and economy level, the civilization standard and so on. There exist regional differences in terms of ICT application to China education. Li (2005) classified them into three levels:

- **Top level:** high-quality ICT infrastructure has been built in universities and schools in central cities. Students and teachers can access to the CERNET and the Internet. All the staff and students have a high level of ICT skills. They know how to change the educational model, how to develop curriculum content and how to improve the efficiency of administration through ICT.

- **Middle level:** most universities begin to integrate ICT into courses and administration with a middle-level ICT environment. Only some of the staff is skilled at the ICT use, but they are far from the top level.

- **Lower level:** most schools in rural areas have no money to invest in ICT. Even with sponsorships from donors or governments, ICT is not available to most people. Few staff has accepted ICT training.

Obvious gap can be detected among these three levels, which displays that the present development of ICT application in education is unbalanced.

There are three steps for any country in terms of educational informationisation, proposed by Li (2005):

1. The first is information infrastructure construction.
2. The second is applying ICT into all aspects of education.
3. The third is to change all aspects of the educational system, particularly the education environment, educational content, pedagogy and administration methods.

According to Li (2005), now the first step has been almost completed in the central cities, but not in the villages. It is necessary for the Chinese government to support village schools to finish the step one and to promote other schools to complete the second and third steps as soon as possible.
2.5 Impact of ICT on China Education

2.5.1 Introduction
According to Piasecki (2004), it is clear that ICT holds significant value in all areas of the society. As far as education is concerned, ICT has exerted significant impact on not only education itself but those people who are involved in education as well. This sector mainly discusses about the various impacts resulted from ICT application in educational system.

2.5.2 Main roles of ICT Application in China Education
The roles of ICT in education could be various. From Hepp et al. (2004), some of relatively important roles of ICT are pedagogical, culture, social, professional and administrative. Li (2005) explained the specific roles of ICT in China education as follows:

- CERNET is used to obtain learning resources and form distance education.
- Computers have been connected to form network that can be linked to CERNET and the Internet.
- Multimedia classrooms have been applied to enable the exchange of instructional information (audio, video, Word, etc.) between teachers and students in conventional classrooms.
- Teachers and students have personal computers at home and in schools.
- Instructional platforms become available to support online learning based on local and wide area networks (LANs and WANs) in schools.
- Resource warehouses are being constructed to share learning resources among teachers and students in all subjects.

It is obvious that ICT has taken active part and played an increasingly dominant role in China educational system. However, Collis et al. (2002) believed that the traditional lecture still remained the ‘core medium’ for many higher education institutions with ICT serving as a complement to already existing instructional tools.
2.5.3 Impact of ICT on China Education

Hepp et al. (2004) pointed out that ICT, if sensibly deployed and with carefully selected software, could positively affect many aspects of school life. It has been discovered through the literature review that the impact of ICT on education itself could be classified into the following five points:

- The communication in education is more convenient and efficient via ICT than ever before. A large quantity of digital tools is adopted in learning and teaching.
- CERNET was set up so that resources of learning and teaching of all the subjects could be easily shared between teachers and students through ICT.
- ICT changes the traditional education mode and rules. The new modes of study are “ICT based and distance learning” (Brophy, 2001), which has come into existence and becomes available to all the students in China because of the foundation of the OES by use of ICT.
- ICT supports and improves the development of Students Learning Support Service (SLSS) in China.
- The quality and equity of China education have been boosted and the gap in education between the developing and developed countries has been gradually reduced.

2.5.4 ICT Training

With regard to those who are involved in education such as teachers, librarians, students and ICT specialists, ICT education brings about great challenges to them. Jager and Lokman (1999) mentioned that ICT skills were regarded as a key for teachers and students to use ICT in education. In his perspective, a teacher requires excellent master of all the ICT skills to create a powerful learning and teaching environment for ICT education. Besides, Hogg (2003) suggested that one of the most serious challenges facing to people is the provision of infrastructure like networks and computers for teachers but without the appropriate trainings necessary for them to take advantage of these ICT resources. He believed that with no proper ICT trainings for teachers and students, the construction of ICT infrastructure was only a
waste of money. Li (2005) put forward that in order to integrate ICT into education, more people with specialized knowledge of educational technology are required, particularly on the part of teachers and administrators.

On the other hand, Clark and Kalin (1996) suggested that training was critical for successfully handling the stress brought on by technological change. Spacey et al. (2003) said: “research indicates that training has a positive role to play in acclimatizing people to the changes taking place around them.” It is obvious training is a given to meet the requirements for teachers, librarians, students and specialists of ICT to grasp ICT skills well enough so that they can confidently use ICT skills in learning and teaching without difficulties.

In China, the ICT trainings have been widely carried through in lots of universities, colleges and training institutes. In 2002, Li (2005) said that the Teacher Education Department of the Ministry of Education published a very important document “Training Guidance for Teacher Training about Information School”. This document asked for all the teachers in the primary and secondary schools to learn how to utilize ICT in professional practice activities.

2.6 Impact of ICT on Libraries and Librarians

2.6.1 Why ICT in libraries

One important part of the ICT application in education is to introduce ICT into libraries. With the surging demands for information in this information era, the requirements for librarians and the corresponding pressure on them are higher. Häggström (2004) proposed that libraries and professional librarians have to change and adapt to new demands, professional tasks and working conditions. To achieve this goal, the assistance of ICT is absolutely necessary. Piasecki (2004) explained that the introduction of ICT was one way in which libraries were both adhering to and anticipating the needs of its users. Without ICT, libraries will be left behind
according to Bulter (2002). Thus, an increasing number of libraries are now utilizing ICT to ensure information to be efficiently managed and offered to users.

2.6.2 ICT Application in Libraries

ICT has generated digital information materials which now are broadly used in libraries and frequently offered to users. Digital information materials bring huge benefits and great convenience for libraries’ routine work in terms of information provision to users, which is determined by the characteristics of ICT itself. Some of the characteristics are introduced as follows according to UNESCO (2003):

- Digital information can be simultaneously sent in multiple copies over information networks in fractions of a minute or even of a second. There is no need for users with PCs attached to the network to physically go to the library since information can be easily accessed via their PCs.
- Digital information can be conveniently cut and pasted from one document into another.
- Digital information may be free or cheaper than print equivalents.

Because of these highlighting points, digital information based on ICT is increasingly welcome by users. Exactly to meet their demands for digital information, the range of the ICT application in libraries is consequently further expanded. Besides Internet access, there are many other applications of ICT in libraries including library management systems that increase the effectiveness of service provision according to Batt (1998). As Gallimore (1997) stated, libraries are becoming dependent on IT for services delivery, daily management and administration.

2.6.3 Impact of ICT on Libraries

Library is now regarded as a source of information rather than as a solely place for the provision of books and leisure reading. Since ICT appeared in libraries, there is move towards the provision of information instead of leisure reading, as Bulter (2002)
found in his research. His findings also included the following:

- Libraries have diversified the range of services. CDs, videos and many other kinds of information are offered in addition to books.
- Libraries are now more like information centers rather than book lending as they originally were.

Towers (2001) commented that with the emergence of the information society the role of public library was changing and new roles were being developed, alongside more traditional ones, in order to meet and anticipate user requirements. Virkus & Metsar (2004) illustrated such changes in the following diagram:

**Diagram 2.1—Changes in Libraries**

According to UNESCO (2003), the exact impacts of ICT on the library are shown as follows:

- ICT made information creation in digital format possible.
- ICT made online access and file transfer possible.
- ICT made networking and sharing of information resources possible.

With such a development, library may not only be networked and stocked with a core collection that is multimedia but also have access to global information and become digital and virtual.
2.6.4 Impact of ICT on Librarians

Quite a few challenges resulted from ICT application in libraries are facing to librarians in that they should be much more skilled in ICT to adapt themselves to this eternally changing information era. These challenges comprise mastering ICT knowledge, ICT skills, and ICT tools, and even keeping continuously learning in the context of rapid change of ICT. UNESCO (2003) believed that only the librarians with such knowledge, skills and tools in an information society are the key success factors in enabling the library to perform its role as learning support system. Peacock (2000) put forward the following new skills that librarians should master in Information era:

- Sound pedagogical knowledge
- Good technological skills
- Advanced teaching skills
- Ability to develop and deliver effective learning experience

The introduction of ICT into libraries has also altered the roles of librarians in relation to the new role of the library according to Bulter (2002). Piasecki (2004) believed that ICT brought the role expansion of librarians as well as corresponding extra responsibilities despite the job description remained same.

In conclusion, it is discovered through literature review that the beneficial impacts of ICT on librarians can be summarized into the following aspects:

- The roles of librarians in learning support have been shifted and expanded to some extent, which also means extra responsibilities for librarians.
- ICT has allowed library assistants to achieve personal development such as ICT skills and more fulfillments due to an expansion of more varied duties. Line (1997) particularly pointed out that librarians themselves need self-development to enable the support of learning in others.

On the other hand, Piasecki (2004) put forward that ICT also became a constraint on
the already limited time of librarians. According to Nawe (1995), a library operates as a constant cycle resulting in the fact that there will never be enough time to do everything that needs to be done for librarians. But Piasecki (2004) discovered that ICT introduced another time-consuming duty for librarians. He put forward that librarians should achieve the balance between the benefits and constraints from ICT.

### 2.6.5 Changing Roles of Librarians in Learning Support

Goulding (1996) provided one job description of librarians: to contact with users, work with and help people were the main attraction and greatest appeal of library work for librarians. Bulter (2002) listed two traditional roles of librarians:

- To support learning
- To provide access to information

Moreover, Ford (1995) explained that librarians had traditionally supported independent learning and especially lifelong learning.

Since ICT has participated in the activities of information provision in libraries, Bulter (2002) thought these roles were affected by ICT and librarians needed to understand the relationships between them and ICT. Batt (1999), in agreement with Bulter, saw ICT as a way to extend the traditional roles of librarians. Proctor and Bartle (2002) also discovered that the prevalence of ICT in libraries meant a change in roles for librarians.

Proctor and Bartle (2002) pointed out that the librarians’ role of trainer/instructor had come to the fore. Stephens (2001) agreed and said that librarians, in turn, had assumed the role of trainers and instructors. This educator/facilitator role required a more active involvement in people’s learning and the training of both users and librarians according to Bulter (2002). Pinto et al. (2004) elaborated on the process of transforming into this new librarians’ role—educator/facilitator in the following diagram:
In addition, Nacka (2004) pointed out another important role of the librarians. It is that librarians should identify and evaluate the quality of online resources so as to enable users to maximize their use of the new global networks where the information always lacks the traditional benchmarks of quality authenticity.

UNESCO (2003) revealed some perceived roles of librarians in learning and teaching in an information society. (See as follows)

- **Creators**: developers and producers of information products and services
- **Collectors**: librarians, archivists and records managers
- **Communicators**: information workers, extension workers, subject specialists
- **Consolidators**: reference librarians, information brokers, analysts

However, Morrison et al. (1998) found that in the area of information technology people recognized that many librarians remain unable to meet the public’s expectation that they would be capable to assist them in their IT focused learning. Proctor & Bartle (2002) mentioned that librarians also needed to be trained to offer specific computer resources and solutions, which presupposed a level of expertise in identifying and accessing quality electronic resources as well. According to Bulter
2002), the training can lead to the five new advanced roles of librarians:

- Net navigator
- Information technology gatekeeper
- Information consultant
- Information manager
- Educator/Facilitator

Oppositely, Brophy (2003) put forward an extraordinary opinion. He believed that the librarian would become a very irrelevant role in reality. Grimes (1998) agreed and pointed out the reason might be that librarians were not often involved in information policy development and libraries might become only museums of books without any practical value in the future.

2.7 Summary and Conclusions

Through literature review, the definitions of ICT and ICT education are clearly introduced. The current level of ICT application in education and how ICT has influenced the China education are fully examined as well. Especially, the use of ICT in libraries and the impact of ICT on roles of librarians are identified.

Due to the ICT application into the educational system, China higher education has been greatly influenced. The content and form of higher education have altered to some extent. The Chinese government set the goals and policies of ICT application in education in purpose of systematically implementing Chinese Educational ‘Informationisation’. Till now, remarkable achievements have been gained in ICT application into education, though there are some problems expected to solve such as regional gap. Besides, the roles of ICT in education are varying with the development of ICT education. Different impacts of ICT have been exerted on education including improving quality and equity of education, narrowing down the gap of education between the developed and developing nations and generating the
new instructional mode—online education. Finally, the librarians’ tasks and roles have been added based on the traditional ones since the introduction of ICT. The library has gradually become an information center. After the adequate training, many new advanced roles such as educator/facilitator and net navigator can be realized and will be altered even further.

The literature review acting as a background introduction covers the first four objectives listed in Chapter 1. More detailed information regarding ICT application in China education and specific changes of Chinese librarians’ roles will be studied in my research.
Chapter 3: Methodology

3.1 Introduction

This chapter intends to illustrate why some particular research approaches and methods to conduct this research. It not only describes the whole process from sample select to data recording and analyzing but also explains why these methods are effective, which is supported by literature review from a variety of researchers.

3.2 Research Approach

3.2.1 Introduction

Generally speaking, to attain the data required, an inductive approach, together with the use of both quantitative and qualitative research methods, was essential for this research.

The selected research approach through which this study was carried out is essentially inductive in nature because this research doesn’t attempt to “answer or test any pre-determined hypotheses but instead allow questions and issues to be explored openly” (Patton, 1990). This dissertation is based on ‘grounded theory’ that refers to ‘the discovery of theory from data systematically obtained from social research’ (Glaser, 1968). Consequently, conclusions are allowed to generate after the data are gathered and analyzed. In other words, “a theory is built up from the bottom” (Gorman & Clayton, 1997) in this research which will conclude to “satisfy what this study sets out to answer and investigate” (Piasecki, 2004).

What’s more, quantitative approach, together with qualitative approach, was adopted in this study. Both quantitative and qualitative data were collected through such methods as case study, questionnaire and interviews. Before the use of these methods, literature searching and review were conducted.
3.2.2 Quantitative Approach

The quantitative approach, relatively suitable for large-scale researches, “holds that researcher should remain independent and distant from the research process; the use of surveys, questionnaires, and so on lends itself to this type of research” (Coombes, 2001). Generally speaking, the quantitative approach is used to explain what has happened and what will happen. It involves measuring and counting responses, categorizing data and answering the questions. Gorman & Clayton (1997) explained that quantitative data used numerical representations to quantify occurrences. As a kind of statistical methods, quantitative approach is especially useful for not only looking at relationships and patterns but also expressing these patterns with numbers according to (Rudestam & Newton, 2001).

Rudestam & Newton (2001) pointed out that quantitative research designs were used to determine aggregate differences between groups or classes of subjects. Thus, emphasis should be placed on “precise measurement and controlling for extraneous sources of error” (Rudestam & Newton, 2001). They also put forward two procedures to accomplish the methodological control (See as follows):

- Random sampling
- Randomization

Despite all that the quantitative approach enjoys better objectivity and is able to conveniently generalize the results of the study from samples to a large number of population by use of random sampling, the disadvantages are found through literature review and summarized into the following two aspects:

- Imprecise measurement is easy to happen in data analysis.
- Extraneous errors are hard to be controlled and completely eliminated.

3.2.3 Qualitative Approach

According to Coombes (2001), qualitative research is often applied to small-scale research where the researcher is engaging in interviews, life histories and
observations. Denzin & Lincoln (2000) offered the definition of qualitative research:

“Qualitative research is a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that make the world visible. These practices... turn the world into a series of representations including field notes, interviews, conversations, photographs, recordings and memos to the self... Qualitative research involves an interpretive, naturalistic approach to the world. This means that qualitative researches study things in their natural settings, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them.” (Denzin & Lincoln, 2000: 3)

As Rudestam & Newton (2001) introduced, qualitative implies that the data are in the form of words as opposed to numbers. They explained that whereas quantitative data were generally evaluated using descriptive and inferential statistics, qualitative data were usually reduced to themes or categories and evaluated subjectively with more emphasis on description and discovery.

There are still some disadvantages with qualitative approach, as Coombes (2001) stated. They can be summarized as follows:

- The researcher may subjectively lay their own values and biases on the information gathered.
- At a practical level, one-to-one-type research is very time consuming and can be costly, especially if much travel is involved.

Hence, if the qualitative approach is used, the researcher should be aware of their own value judgments and strive to view the gathered data by an objective approach, suggested by Coombes (2001). Moreover, he also pointed out that in the qualitative research process the researcher should try to interact with those were studied and a relationship was fostered.

3.2.4 Summary

Bell (1999) indicated that each approach had its strengths add weaknesses and each was particularly suitable for a particular context. Liebscher (1998) said: “A
quantitative research methodology is appropriate where quantifiable measures of variables of interest are possible and where hypotheses can be formulated and tested. Qualitative methods are appropriate when the phenomena under study are complex, are social in nature, and do not lend themselves to quantification.” Bouma & Atkinson (1995) described the difference between these two research approaches:

“The difference might be summarized by saying that quantitative research is structured, logical, measured and wide. Qualitative research is more intuitive, subjective and deep… In some cases both methods can be used.” (Bouma & Atkinson, 1995:208)

Fierro (1999) pointed out that the two approaches were not mutually exclusive and could very well support each other in most social science inquiry. Coombes (2001) suggested that it might be far better to combine several research methods in order to achieve a well-balanced and meaningful conclusion. A combination of quantitative and qualitative methodologies mixes the rigor and precision of experimental designs and quantitative data with the depth understanding of qualitative methods and data according to Rudestam & Newton (2001).

As a result, both quantitative and qualitative methods and data are used to study the different phenomenon within this study. A ‘sequential study mode’, suggested by Creswell (1998), is chosen, in which the researcher begins with generating quantitative data and then gathers qualitative data in two distinct phases.

In context of this study, quantitative approach mainly assists to collect useful factual data about what happens to the application of ICT in China general higher education and to get a brief idea about the attitudes of teachers and students towards the ICT application in higher education, while qualitative approach is used to provide the opportunities not only to gain a broad insight into how ICT application has affected China general education and the roles of librarians in learning support but also to attain more detailed information relevant to the ICT infrastructure construction in Tongji University.
3.3 Investigation Methods

3.3.1 Literature Searching and Review

Before the case study and questionnaire survey, a literature searching and review was essential to provide background information, identify gaps that could be further studied and find what the potential trends might be (Busha & Harter, 1980). Gorman & Clayton (1998) mentioned that nothing could substitute reading around in the relevant literature. The literature searching and review is regarded as a very significant method of data collection in my dissertation to know about the situation of ICT application in higher education around China and its development trends.

Literature searching involved using such key words and structured search phrases as ICT, ICT education, ICT in China higher education, ICT impact on education, roles of librarians, ICT impact on librarians, etc. to retrieve in online university library catalogues, electronic journal databases including LISA and Emerald Library. One Chinese online chargeable database was searched for it offered a lot of academic journals, articles, dissertations and thesis related to my topic, while Google search engine was used to expand my search by use of its advanced search. References from those searched results were checked as well. Both the materials published in UK and China within the last five years were searched and referred. Some of the cited materials were in English; others were originally in Chinese and translated into English when they were cited in my dissertation. The following diagram illustrates the basic structure of my subject search. See as follows:

Diagram 3.1—Literature Search Model
The overall aim of literature review is to establish a background of ICT education development in China and illustrates an overall picture of what findings were already achieved regarding my topic. The subject of the literature review was related to every objective and investigated in great details one after another. Moreover, some ideas from the literature are also served as a complementary support to the results and conclusions in my dissertation.

3.3.2 Case Study

Bell (1999) proposed that case study was especially suitable for individual researchers in that it provided an opportunity for one aspect of a problem to be explored in depth within a limited time scale. In Bell’s point of view, the major strength of case study is that it permits the researcher to focus on a specific example or situation and then to identify the various interactive processes at work. But Coombes (2001) put forward the different opinion. He addressed the weaknesses of case study and they are summarized as follows:

- The research is limited in scope so that case study is not appropriate for the basis of generalization.
- Case study may lack control over variables.
- Cases might not be representative enough to make the findings generalized.
- The research of case study might be prone to bias.

However, the limited time and resources available to this research means that this research has to be restricted to a geographical area, which consequently determined the use of case study approach. As to the case, Shanghai Tongji University is a medium university with almost 100-year history. It has four campuses distributed in different areas in Shanghai. These campuses were set up at different time. The reason of choosing this university as my case is mainly because it enjoys a moderate education level and is a typical representative of those universities in China in terms of the ICT application in education. However, this case study is only to generalize its findings or recommendations in the situation of China higher education.
3.3.3 Questionnaire Survey

According to Bell (1999), the advantage of survey is that it is possible to obtain information that can be analyzed, patterns extracted and comparison made. Questionnaire, as a method of quantitative approach, was adopted as the major investigation method to collect as clear a picture as possible about the current situation regarding ICT application in Shanghai Tongji University as well as the attitudes of teachers and students towards ICT application in education.

The [http://express.perseus.com/perseus/asp/login.aspx](http://express.perseus.com/perseus/asp/login.aspx), an online questionnaire website, was drawn on to publish my questionnaire and e-mail was utilized only to distribute the web page’s address to potential samples. The responders could easily fill in the questionnaire online. In spite of some technological problems such as “delivery failure that was regarded as a disadvantage of using e-mail as a distribution method” (O’Lear, 1996), e-mail could “survey persons… that are geographically dispersed” (Roselle & Neufeld, 1998), increase the “delivery speed with reduced cost involved” (Schaefer & Dillman, 1998). Therefore, it was still adopted in my research.

Both teachers and students from different departments and campuses of Shanghai Tongji University were requested to fill in the questionnaire that was mainly comprised of close ended questions to collect factual data, together with only a few open ended questions gather attitudinal data. These questions were divided into four parts with regard to distinct information:

- **Personal Information**
  This part was to know about the age and degree information of the responders as well as the campus they stayed in.

- **ICT Infrastructure & ICT Application**
  This part was designed to get a brief idea about the present situation of ICT application of in education as well as the ratio of computers-per-student.

- **ICT Skills & Training**
This part was designed to identify what ICT skills teachers and students had ever learned and adopted in learning and teaching.

- **Attitudes**

This part was to explore the attitudes of students and teachers towards ICT education and libraries.

### 3.3.4 Interview

An obvious advantage of interview is its “adaptability” (Bell, 1999). He explained that a skillful interviewer was able to “follow up ideas, probe responses and investigate motives and feelings”, which the questionnaire cannot achieve. However, the problems with interviews are that they are time-consuming and highly subjective running the risk of the danger of bias. Besides, the responses of interviews are certainly not so easy to analyze as those of questionnaires. But these disadvantages are overweighed by its advantages, especially “the immediacy and personal contact” (Gorman & Clayton, 1997).

Because of the need of this study, another method of data collection was adopted by use of msn and telephone. Both “semi-structured and unstructured interviews”, suggested by Coombes (2001), were drawn on to respectively interview students and a librarian who are studying and working in Shanghai Tongji University. Thus, different standpoints could be obtained. The interviews were respectively designed for them with emphasis on distinct problems in purpose of getting as full a picture as possible regarding the whole situation of the ICT infrastructure in this university and the impact of ICT on library use and librarians’ roles. A number of questions were prepared ahead to ensure all the issues covered.

**a) Interview with Students**

The interviews with the four students coming from various departments and different campuses were semi-structured and consisted of many open-ended questions and a few close-ended questions. Those questions were designed to clarify the situation about ICT infrastructure in that university and especially about the ICT impact on
library use and education. The interviews were conducted via msn and full of interactive conversations and discussions. A lot of relevant details were added through these interviews.

b) Interview with a Librarian
The interview with a librarian who has worked in the Shanghai Tongji University’s libraries for around 8 years was to gain the information about how ICT influenced libraries and the roles of librarians in learning support. The interview is unstructured and full of open-ended questions that allow an interactive conversation. The interview was conducted through telephone. All the pre-prepared questions were covered and sufficient details were added in 30-minute talk.

3.3.5 Pilot Study
According to Bell (1999), it is necessary to critically test the reliability and validation of the designed questionnaires and interviews to make sure whether they work well enough to exactly meet the expectation before they are formally carried out. Thus, a pilot study was conducted. Both of my questionnaire and interviews were first sent to some friends and teachers who are sensible equivalent to my formal samples. After the trial test, a few mistakes were corrected and some questions with ambiguity to the respondents were clearly redesigned. Besides, some original single analysis questions were emerged into cross analysis questions to enable the questionnaire more structured and succinct. Through the pilot study and modification, the process of data collection became more reliable and valid.

3.3.6 Sampling
The volunteer sampling, introduced by Coombes (2001), was utilized in this study. My questionnaire’s respondents were comprised of students and teachers in Shanghai Tongji University. They were reached by requesting volunteers via email. To avoid bias, I asked for my friends studying in that university to send out emails to the students and teachers of all the departments and in every campus through group sending. Thus, basically speaking, it was a random sampling. As to the interviewees,
four students who were studying in different departments and distinct campuses of Tongji University and were familiar with the educational system in that university were invited. Besides, a librarian who had worked in the library of that university for around 8 years and was in charge of the routine work was selected.

3.3.7 Recording Methods
The responses to questionnaire were automatically recorded and transcribed into summary sheets by the online website mentioned above. The only thing I should do was to directly export the responses to the Excel spreadsheets. On the other hand, the interviews via msn were automatically saved as the message history records in the computer, while the interviews via telephone were manually recorded by taking notes. All the responses of interviews were transcribed into summary sheets because summary sheets made the responses clear and systematically organized, which was beneficial for data analyzing.

3.4 Data Analysis
Excel, a statistical package, was draw on to analyze the quantitative data obtained by questionnaires. The results were presented in various kinds of diagrams drawn by use of Excel. Some relevant results were compared against each other.

Besides, content analysis, as a method of data analysis of qualitative approach, was used to analyze the data of interviews and some open questions in the questionnaire. After analysis, the opinions of responders were classified and quotes from them were used as support to the analysis and conclusions.

3.5 Summary
This Chapter explained why the inductive approach was adopted through its appropriateness to this investigation. The suitability of both quantitative and qualitative approaches utilized to collect various data was justified through the
comparison of their strengths and weaknesses, while the reason why literature searching and review and the case study were used in this research was illustrated. Besides, the design of questionnaire and interviews was clearly introduced and the whole process of interview was briefly reviewed. In addition, the adopted methods of sampling, pilot study and recording were introduced and explained. Finally, the data analysis process was presented. The whole research process is clearly illustrated by the following diagram.

**Diagram 3.2—Research Process**
Chapter 4: Data Analysis and Findings

4.1 Introduction

This section reports the results of the questionnaire survey and the interviews conducted in Shanghai Tongji University. This survey and the interviews were designed to satisfy the second to the fourth objective of this study. Relevant data description and analysis will be listed in tables or displayed by diagram in this sector, after which the findings attained from these data will be discussed in details.

4.2 Questionnaire Survey

4.2.1 Response Rate

The questionnaire survey was distributed to teachers and students of different departments in the four campuses of Shanghai Tongji University. There are 127 responses to the questionnaire in all, 9 of which are invalid. See as follows:

<table>
<thead>
<tr>
<th>Count</th>
<th>Valid Responses</th>
<th>Invalid Responses</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>118</td>
<td>9</td>
<td>127</td>
</tr>
<tr>
<td>Percentage</td>
<td>92.91%</td>
<td>7.09%</td>
<td>100%</td>
</tr>
</tbody>
</table>

4.2.2 The Sample

The sample includes teachers and students composed of undergraduate, master and Ph.D students. See as follows:

<table>
<thead>
<tr>
<th>Label</th>
<th>Teachers</th>
<th>Undergraduate Students</th>
<th>Master Students</th>
<th>PhD Students</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>12</td>
<td>55</td>
<td>32</td>
<td>19</td>
<td>118</td>
</tr>
</tbody>
</table>

The percentage of undergraduate students is highest with 46.6%, followed by master students and Ph.D students, while teachers occupy the smallest proportion with only 10.12%. See as follows:
Among the 118 responders, all of the undergraduate and master students are 20 to 25 years old, while all the Ph.D students are 26 to 30 years old. 3 out of 12 teachers are above 50, 4 are between 41 and 50, and the rest 5 are 31 to 40 years old. It is obvious that the 20-25 year old responders hold the highest proportion with 73.7%. See as follows:

<table>
<thead>
<tr>
<th>Label</th>
<th>20-25</th>
<th>26-30</th>
<th>31-40</th>
<th>41-50</th>
<th>Above 50</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>87</td>
<td>19</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>118</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>73.7%</td>
<td>16.1%</td>
<td>4.2%</td>
<td>3.4%</td>
<td>2.6%</td>
<td>100%</td>
</tr>
</tbody>
</table>

These responders come from the four campuses of Shanghai Tongji University. See as follows:

<table>
<thead>
<tr>
<th>Label</th>
<th>Main Campus</th>
<th>Hudong Campus</th>
<th>Huxi Campus</th>
<th>Jiading Campus</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>38</td>
<td>28</td>
<td>27</td>
<td>25</td>
<td>118</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>32.2%</td>
<td>23.7%</td>
<td>22.9%</td>
<td>21.2%</td>
<td>100%</td>
</tr>
</tbody>
</table>

The number of the responders from Hudong, Huxi and Jiading campus are almost same, around 27, and their percentages are a little more than 21%, while the number of responders from Main Campus is biggest with 38, reaching 32.2% and 10% more than those from the other campuses in that the students in the main campus are quite more than those in the other campuses.
In terms of the level of computer ability, most of these responders claimed to be intermediate or experienced, with respectively 51.7% and 33.9%. Only 10 out of 118 responders are novice and 7 are expert. See as follows:

**Fig 4.2—Computer Ability**

<table>
<thead>
<tr>
<th>Level</th>
<th>Percentage</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Novice</td>
<td>5.9% (7)</td>
<td></td>
</tr>
<tr>
<td>Intermediate</td>
<td>33.9% (40)</td>
<td></td>
</tr>
<tr>
<td>Experienced</td>
<td>51.7% (61)</td>
<td></td>
</tr>
<tr>
<td>Expert</td>
<td>8.5% (10)</td>
<td></td>
</tr>
</tbody>
</table>

**4.2.3 ICT Infrastructure & ICT Application**

The fifth problem was designed to examine how many students have their own computers in a dormitory of Shanghai Tongji University. 80 out of 118 responders confessed every student in their dormitories possessed a computer, the percentage of which is 67.8%. Through the data from this problem, there are 488 students occupying 413 computers. Thus, the computers-per-student ratio is 0.9, which means 10 students have 9 computers. In other words, 9 out of 10 students have a personal computer.

The question 6 was to examine what computers are mainly used for in Shanghai Tongji University. 107 out of 118 responders ticked the didactical use by teachers, which enjoys the highest percentage with 90.7%. The second two important uses are classrooms use by students and administrative purposes, respectively ticked by 76.3% and 68.6% responders, while 55.08% responders chose communication purpose. See as follows:
Besides, one responder proposed that computers were also frequently used in leisure time for learning purposes as well as entertainment purposes.

As to the frequency of computers and the Internet use, examined by the question 7, the relatively major responders chose above 8 eight hours per day, with 48.3% for computers use and 39.0% for Internet use, ranking highest among all the choices. The percentage of the responders choosing around 5-7 hours per day for computer use and Internet use are very similar, with respectively 28.0% and 28.8%. The same case happens to the choice of around 2-4 hours per day, with lower proportion that is 20.3% for computer use and 22.9% for the Internet use. Few chose under 2 hours per day for computer and Internet use, the percentages of which are extremely low, with respectively 3.4% and 9.3%. See as follows:

![Table 4.5—Computer and Internet Use Frequency](image)

<table>
<thead>
<tr>
<th>Label</th>
<th>Above 8 hours per day</th>
<th>Around 5-7 hours per day</th>
<th>Around 2-4 hours per day</th>
<th>Under 2 hours per day</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage</td>
<td>48.3%</td>
<td>28.0%</td>
<td>20.3%</td>
<td>3.4%</td>
<td>118 (100%)</td>
</tr>
<tr>
<td>Computers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internet</td>
<td>39.0%</td>
<td>28.8%</td>
<td>22.9%</td>
<td>9.3%</td>
<td>118 (100%)</td>
</tr>
</tbody>
</table>
Generally speaking, four devices are used in class to present lecture handouts. See as follows:

From the 118 responses to the question 8, it is found that 33.1% persons said paper was never used in class and 28.0% suggested the same situation of overhead projector, while only 4.2% and 0.8% responders selected never for respectively blackboard and data projector. On the opposite, 21.2% of responders mentioned
blackboard was always used, ranking highest among the four devices and followed by data projector with 17.0%. No one chose overhead projector and paper as always used. The similar case happens to the usually used device.

Among the four devices, 61 out of 118 responders considered data projector as the most often used device in the question 9, with 51.7%, ranking highest among the four devices. The second highest is blackboard selected by 40.7% people. See as follows:

The case is completely opposite when referring to the least often used device, which was answered by 113 responders. 57.5% of them thought paper was least often used in class and 42.5% selected overhead projector. Moreover, 3 responders proposed only data project was used in class, while 1 person mentioned only blackboard was utilized.

The tenth question aims to check which are the frequently used devices in learning and teaching. 80.5% responders replied that they never used PDA, while 50.9% said they rarely used scanner. As for fax, the majority responses fall at the never and rarely as well, with respectively 41.5% and 38.9%. However, 47.5% responders mentioned they usually used printer, while 86.44% responders always used operation system and 73.7% always used application software. See as follows:
Among 118 responses to the eleventh question which is to explore the frequency of visiting university library homepage and going to the library, the most responders chose once per month for visiting library homepage with 22.0%, followed by those who visited once or twice per week with 21.2%. 6 people claimed that they never visited university library homepage, while 1 person rarely did. See as follows:

**Fig 4.8—Frequency of Visiting Library’s Homepage & Going to the Library**

(1=Every working day, 2=Three of four times per week, 3=Once or twice per week, 4=Once two weeks, 5=Three times per month, 6=Once per month, 7=Never, 8=Rarely, 9=Sometimes)

As for going to the library, those who went to the library three or four times per week
enjoy the highest percentage with 27.1%, followed by 26.3% responders who did that three or four times per week. However, one responder said he never went to the library and another one said sometimes, while two responders rarely went to the library.

The twelfth question tries to find whether the students and teachers find information via ICT. The result is that online search engine such as Google is used by the most people with 96.6%. The percentage of those physically searching in the library is 62.7%, 12% higher than that of who chose electronic resources on the library homepage. Besides, two responders mentioned they turned to lecture handouts, while one asked the books used in class for help. See as follows:

Table 4.6—Information Search

<table>
<thead>
<tr>
<th>Label</th>
<th>Search on Internet by Search Engine such as Google</th>
<th>Electronic Resources Existing on the Library’s Homepage</th>
<th>Physically Search in the Library</th>
<th>Others</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>114</td>
<td>60</td>
<td>74</td>
<td>3</td>
<td>118</td>
</tr>
<tr>
<td>Percentage</td>
<td>96.6%</td>
<td>50.8%</td>
<td>62.7%</td>
<td>2.5%</td>
<td></td>
</tr>
</tbody>
</table>

The thirteenth question was designed to find how many modules have their own web pages. See results as follows:

Fig 4.9—Module Web Pages

Among 118 responders, 78.8% said their modules had web pages, while 21.2%
announced *none* of their modules had. Among the former, 55.1% suggested only *a few* modules had web pages, followed by those who said *most* modules had web, with 17.8%. The percentage of who chose *all* is extremely low with only 5.9%.

The fourteenth question aims at what information and services the web pages of modules provide. Among the 93 responders, the most responses fall at module outline and lecture handouts, the percentages of which are both 61.9%. The next is the assignments introduction chosen by 59.3% people. And the percentages of useful links of online resources and online submission of coursework are both 55.1%, followed by BBS with 50.8%. Reading lists occupies 45.8%, while assessment takes the 37.3% scale. Chatrooms holds the least proportion with only 8.5%, less than the half of the percentage of opinion roll that is 17.8%. See as follows:

**Fig 4.10—Information and Services Provided by Module Web Pages**

It is discovered from the question 15 that 89.8% people said their departments had homepages, while only 12 responders said *no* to this question. See as follows:
Table 4.7—Department Homepage

<table>
<thead>
<tr>
<th>Label</th>
<th>Yes</th>
<th>No</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Count</strong></td>
<td>106</td>
<td>12</td>
<td>118</td>
</tr>
<tr>
<td><strong>Percentage (%)</strong></td>
<td>89.8%</td>
<td>10.2%</td>
<td>100%</td>
</tr>
</tbody>
</table>

All the 106 responders who admitted that their departments had web pages chose the department introduction in the sixteenth question that was designed to examine what information and services department homepages provided. The next is course introduction selected by 88.7% responders. The percentage of learning and teaching resources is 72.6%, a little more than that of career information and contact details whose proportion are respectively 68.9% and 67.9%. Only 52.8% persons selected research introduction. 21 responders mentioned department homepages also offered other links such as meeting notice, guest speakers’ lectures and so on. See as follows:

**Fig 4.11—Information and Services Provided by Department Homepages**

The seventeenth question is to examine whether teachers and students use ICT to communicate with each other. However, the result is that the most people with 73.7% use face-to-face talk, on the neck of which is email selected by 70.3% people. Telephone ranks the third and is used by 54.2% responders, while 22.9% of people use online BBS and 16.1% use chat tools, much less than that of email and face-to-face talk. Only 2.5% people chose online chatroom. See results as follows:
4.2.4 ICT Skills and Training

The eighteenth question was set to test whether teachers were given the opportunities to learn how to integrate computers into classroom practice. But the result is amazingly disappointing. Among the 12 teachers who responded, none of them accepted training about ICT skills.

The nineteenth question tries to discover what ICT skills are often used by teachers and students and what ICT skills they had learned. There is no surprise that 100% responders adopt keyboard operation and mouse operation, followed by the word processing with 96.6%. E-mail exchange and web surfing are also selected by the majority persons, with respectively 95.8% and 94.1%. On the other hand, the skill of database is adopted by the least people, with 44.1%, 3.4% less than the percentage of setting up sites.

The situation was different when referring to the trained ICT skills. Word processing and spreadsheets rank highest among all the trained ICT skills, with the same percentage of 78.8%, on the heels of which is programming with 75.4%. The skill of
making presentation materials (Powerpoint) ranks the third with 70.3%. The proportion of drawing by use of computers was lowest with 57.6%, while the scales of the other ICT skills are around 68%. See as follows: (Y-coordinate shows the percentage and the definite numbers of responses are marked above each column.)

**Fig 4.13—Trained and Adopted ICT Skills**

(1=Keyboard operation, 2=Mouse operation, 3=Word processing, 4=E-mail exchange, 5=Web surfing, 6=Data retrieval, 7=Drawing by use of computers, 8=Spreadsheets, 9=Setting up sites, 10=Programming, 11=Database, 12=Making presentation materials, 13=Others)

4.2.5 Attitudes

The twentieth question asked the responders to evaluate the ICT application level in Shanghai Tongji University. The most responders with 39.0% gave 4, which is followed by 32.2% persons who gave 3. Besides, 20.3% persons gave the highest mark: 5 to excellent. However, it seems no one is willing to give low mark. Only two persons gave 1 to poor and eight gave 2. See results as follows:
As to the attitude towards ICT application in education examined by the question 21, among 118 responders, those who chose somewhat like occupy the highest proportion with 39.0%, which is followed by 25.4% persons who chose very like and 24.6% people who chose extremely like. Only 2 people chose somewhat dislike and no one chose very dislike and hate. See results as follows:

As far as the impact of ICT application on education examined in the question 22 and 23, the absolute majority responders, with extremely high percentage beyond 90%, believed ICT offered faster access to information and make their study or teaching more convenient and efficient. Only 4 out of 118 people denied the ICT brought the faster access to information and 8 persons said ICT didn't bring convenience and
efficiency to their study and teaching. See results as follows:

**Fig 4.16—Impact of ICT application in education**

![Impact of ICT application in education](image)

The similar situation happens to the attitude towards library which was tested in the question 24. When asked whether library should exist if all the materials and information required are available online, 91.5% people said yes, while just 10 out of 118 people said no.

**Table 4.8—Attitude Towards Library Existence**

<table>
<thead>
<tr>
<th>Label</th>
<th>Yes</th>
<th>No</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>108</td>
<td>10</td>
<td>118</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>91.5%</td>
<td>8.5%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Quite a few responders explained why the existence of libraries is necessary in the question 25. Through content analysis, the reasons could be classified into following points:

- It’s very tiring to look at the computer screen and read the online materials for a long time, which also harms eyes a lot, while traditional books don’t harm eyes so much.
- It’s more quick and convenient to search information in libraries than on the Internet.
- It’s far more comfortable to read traditional books than online materials and
most people very enjoy the feeling of reading paper books that can’t be achieved by reading online materials.

- Students like to study in libraries where a quiet and comfortable environment as well as a good atmosphere suitable for studying is available.
- The materials provided by libraries are more complete, general and systematic, while some professional books and materials can’t be gained online.
- The quality of the books in libraries is trustful, reliable, while online materials are not safe and their qualities are hard to evaluate due to the lack of efficient management.
- The books and materials in libraries are more stable than online information that may disappear at any time.
- The libraries provide the free access to many chargeable databases.
- Not everyone has access to the Internet, in which case library is the only source of information for him or her.

Still a few people put forward the opposite opinions. They prefer to search information online anytime they want rather than take time to go to the library and think library doesn’t need to exist if all the required information can be found online.

**Fig 4.17—Attitude Towards Library**

<table>
<thead>
<tr>
<th>Importance Level</th>
<th>Number of Responders</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Important At All</td>
<td>3</td>
<td>2.5%</td>
</tr>
<tr>
<td>Not Very Important</td>
<td>1</td>
<td>0.8%</td>
</tr>
<tr>
<td>Somewhat Important</td>
<td>37</td>
<td>31.4%</td>
</tr>
<tr>
<td>Very Important</td>
<td>77</td>
<td>65.3%</td>
</tr>
</tbody>
</table>

The above diagram shows among the 118 responses to the question 26, 65.3%
responders regarded library as very important, which is followed by 31.4% responders who considered it as somewhat important. Only 4 responders thought libraries were not important.

The questionnaire and all the responses listed in tables are attached to this dissertation respectively as Appendix 1 and 2.

4.3 Interviews with Students

4.3.1 Interviewees

Four interviewees are the students respectively from the four campuses and different departments of Shanghai Tongji University. See as follows:

<table>
<thead>
<tr>
<th>Campus</th>
<th>Main</th>
<th>Hudong</th>
<th>Jiading</th>
<th>Huxi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department</td>
<td>Computer Science</td>
<td>Architecture</td>
<td>Soft Engineering</td>
<td>Law</td>
</tr>
<tr>
<td>Title</td>
<td>Senior Students (4th year)</td>
<td>Master Students (1st year)</td>
<td>Master Students (1st year)</td>
<td>Sophomore (2nd year)</td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Duration of learning in Tongji University</td>
<td>4 years</td>
<td>5 years</td>
<td>5 years</td>
<td>2 years</td>
</tr>
</tbody>
</table>

4.3.2 Background Introduction

Two master students and the senior students mentioned they didn’t frequently use computers until they entered the university because the studies before didn’t involve computers too much and even there were no computers at schools.

“I am not familiar with computers and the Internet and have never heard of ICT before 2000 when I entered university.”

—Said the senior student

However, the case happening to the younger sophomore students is different.
“I began to use computers in learning when I was in senior high school, but not so often as today.”

—-Said the sophomore

One master student supplemented that he felt that the ICT was widely applied in China education from 2000 or 2001 and in his university ICT had tremendously developed since then, especially the hardware.

However, another master student pointed out that these four campuses were built in different time and a big difference existed in the level of ICT infrastructure among them. She said:

“The two newly built campuses, Huxi and Jiading Campus, have more advanced and new ICT facilities than Hudong Campus… The main campus rebuilt its ICT infrastructure in 2003. Now it also enjoys a high level in terms of ICT infrastructure.”

4.3.3 ICT Infrastructure & ICT Application

To get more detailed information regarding the situation of the ICT infrastructure in the four campuses of Shanghai Tongji University, all of the four interviewees were asked to fill in several questions.

It is introduced that every campus had a campus network that was set up early or late in recent five years due to the different birth time of these campuses. See as follows:

<table>
<thead>
<tr>
<th>Campus</th>
<th>Main</th>
<th>Hudong</th>
<th>Jiading</th>
<th>Huxi</th>
</tr>
</thead>
<tbody>
<tr>
<td>When to set up campus network</td>
<td>2001</td>
<td>2001</td>
<td>2004</td>
<td>2000</td>
</tr>
</tbody>
</table>

According to the interviewees, Jiading Campus was set up in 2004 and Huxi Campus in 2000, both of which had the campus network from the beginning. All the interviewees admitted that the campus network covered classrooms, offices, university library, public computer rooms and dormitories in their campuses and since the campus network was connected to WWW and the Internet, all the
computers in these places could access to WWW and the Internet in every campus. Nevertheless, the interviewee from Hudong Campus complained a lot about the extremely low speed of campus network in her campus.

It is discovered from the four interviewees that the quantities of classrooms having computers in these campuses are almost same except Hudong Campus. Generally there is only one computer in each classroom. See as follows:

<table>
<thead>
<tr>
<th>Campus</th>
<th>Main</th>
<th>Hudong</th>
<th>Jiading</th>
<th>Huxi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of Classrooms Equipped With Computers</td>
<td>Most (&gt;50%)</td>
<td>A few (&lt;50%)</td>
<td>Most (&gt;50%)</td>
<td>Most (&gt;50%)</td>
</tr>
<tr>
<td>Quantity of Computers per Classroom</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

On the other hand, as the interviewees described, the situation in every campus is slightly different in terms of ICT facilities in offices. In Main campus, some offices accommodate 3 or 4 teachers and everyone has a computer connected to a printer and in other offices teachers share 2 or more computers. Such ICT facilities as printers, scanners and fax are available in most offices. The condition is not so good in Huxi Campus where most offices have around 2 computers shared by 4 or 5 teachers and the facilities such as printers and scanners are only available in a few offices. The situation in Hudong Campus is even worse with only a few offices having one computer and only printers are supplied in several offices without the other ICT facilities. Nevertheless, Jiading Campus enjoys a much better condition. One office only accommodates two teachers and every teacher has a computer that is connected to a printer as well. See as follows:

<table>
<thead>
<tr>
<th>Campus</th>
<th>Main</th>
<th>Hudong</th>
<th>Jiading</th>
<th>Huxi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of Offices Equipped With Computers</td>
<td>All</td>
<td>A few (&lt;50%)</td>
<td>All</td>
<td>Most (&gt;50%)</td>
</tr>
<tr>
<td>Quantity of Computers per Classroom</td>
<td>2-5</td>
<td>1</td>
<td>One per Teacher</td>
<td>2 or so</td>
</tr>
</tbody>
</table>
Other ICT Facilities

<table>
<thead>
<tr>
<th>Other ICT Facilities</th>
<th>Printers, Scanners, Fax</th>
<th>Printers, Scanners, Fax</th>
<th>Printers, Scanners, Fax</th>
<th>Printers, Scanners, Fax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available In</td>
<td>Most (&gt;50%) Offices</td>
<td>Several (&lt;10%) Offices</td>
<td>All the Offices</td>
<td>A Few (&lt;50%) Offices</td>
</tr>
</tbody>
</table>

It is known from the interviews that every campus of Tongji University has a library and the four libraries share one university library homepage which offers library catalogue, search engine, account information and free electronic resources such as database, e-books and online dissertation and thesis on the library homepage. The library in Main campus has 50 computers and 2 printers, without the other ICT facilities, while the library in Jiading Campus has 65 computers or so, together with 4 printers and 2 scanners. The other libraries only provide computers. See as follows:

<table>
<thead>
<tr>
<th>Campus</th>
<th>Main Campus Library</th>
<th>Hudong Campus Library</th>
<th>Jiading Campus Library</th>
<th>Huxi Campus Library</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT Facilities</td>
<td>Around 50 computers</td>
<td>Around 15 computers</td>
<td>Around 65 computers</td>
<td>Around 30 computers</td>
</tr>
<tr>
<td></td>
<td>2 printers</td>
<td>No other facilities</td>
<td>4 printers, 2 scanners</td>
<td>No other facilities</td>
</tr>
</tbody>
</table>

The situation of the public computer rooms significantly differs from one campus to another according to the interviewees. It is said that the main campus has 3 public computer rooms in all. One is in the library, having around 30 very new and high-quality computers equipped with LCD, but every student is only allowed to use computers at most one hour once. Both of the other two also have 30 high-quality computers with LC, without provision of printers, scanners and fax. Huxi Campus has two public computer rooms with around 25 good quality computers each, but no the other ICT facilities as well. Besides, there was only one public computer room with 20 old and low speed computers with no supply of the other ICT facilities existed in Hudong Campus. Jiading Campus enjoys far better facilities. It has 5 public computer rooms and every has 70 high quality and extremely new computers.
equipped with LCD as well as 4 or more printers, 2 scanners and 2 faxes. All of these public computer rooms are free to both students and teachers. See as follows:

Table 4.14—ICT Facilities in Public Computer Rooms

<table>
<thead>
<tr>
<th>Campus</th>
<th>Main Campus</th>
<th>Hudong Campus</th>
<th>Jiading Campus</th>
<th>Huxi Campus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of Public Computer Rooms</td>
<td>3</td>
<td>1</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>ICT Facilities in One Public Computer Room</td>
<td>Around 30 computers</td>
<td>Around 20 computers</td>
<td>Around 70 computers</td>
<td>Around 25 computers</td>
</tr>
<tr>
<td>No other facilities</td>
<td>No other facilities</td>
<td>4 Printers, 2 Scanners, 2 Fax</td>
<td>No other facilities</td>
<td></td>
</tr>
</tbody>
</table>

The interviewees complemented that in fact every department had one or two computer rooms only open to the students of that department, but usually no provision of the other ICT facilities such as printers and scanners. When being asked what they would do when needing to print, scan or fax something, some interviews said they would go to the private shops which supplied students with printers, scanners, fax and the other ICT facilities, but money was charged.

The application situation of two special ICT facilities is particularly investigated. All the interviewees introduced that there were completely no overhead projectors in the classrooms of their campuses, while almost every classroom is equipped with a data projector. See as follows:

Table 4.15—Overhead Projector and Data Projector

<table>
<thead>
<tr>
<th>Campus</th>
<th>Main Campus</th>
<th>Hudong Campus</th>
<th>Jiading Campus</th>
<th>Huxi Campus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity of Classrooms Equipped with Overhead Projector</td>
<td>None</td>
<td>None</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>Quantity of Classrooms Equipped with Data Projector</td>
<td>All</td>
<td>Most (&gt;50%)</td>
<td>All</td>
<td>Most (&gt;50%)</td>
</tr>
</tbody>
</table>

Furthermore, all the interviewees mentioned that some specialized teachers were in charge of managing ICT infrastructure and maintaining ICT facilities in their campuses.
These interviewees also pointed out that the university provided both students and teachers with free university web mail.

From the interviews, it is clear that through ICT, Tongji University has established a new instructional mode—online education (distance/remote education). An interviewee introduced that a remote education department was particularly set up to manage the recruitment and the relevant issues regarding learning and teaching. This department also has a homepage to provide detailed information about recruitment introduction, semester arrangement, module introduction, assessment, career, etc.

### 4.3.4 ICT Impact on Library Use and Education

Four students talked about the impact of ICT on their library use. According to them, the most obvious impact is now they can efficiently and conveniently search books online rather than waste great amount of time on physically searching in the library without purpose. Another interviewee also mentioned: “now usually I search information in the electronic databases on library homepage instead of going to the library… This really saves time.” When the rest three interviewees were asked whether they often used the electronic resources, they gave different answers. One said she never used such resources, while another one seldom used them. They explained that they were not familiar with electronic databases and didn’t want to take time to learn how to search in them. Nevertheless, the other interviewees told that he often used the electronic resources provided on the library homepage. “Now I don’t take trouble to go to the library and can equally gain high-quality academic materials from the electronic databases,” said he.

Finally, the four interviewees were asked to talk about the impact of ICT on their learning. All the interviews said they enjoyed the benefits from ICT that assisted them to gain lots of information far more conveniently and efficiently than before. One interviewee commented that the information resources had been much enriched and communication with students and teachers became geographically unlimited. But
one interviewee pointed out that ICT also exerted negative impact on learning. She said: “ICT reduces the opportunities of face-to-face talk between students and teachers… We are more strange with each other.” Another interviewee felt that ICT put great stress on him. “I should continuously learn ICT skills to adapt this ICT environment. It’s a big challenge for me since I have never used ICT facilities before entering the university,” announce he.

The questions of the interviews with students are attached to this dissertation as Appendix 3.

4.4 Interview with a Librarian

4.4.1 The Interviewee

The librarian interviewed through telephone has worked in the library in Main Campus of Shanghai Tongji University for 8 years. She experienced the whole process of the introduction of ICT into her library by herself.

4.4.2 ICT Application in the Library

At first, some questions about the situation of ICT application in the library of Main campus were asked. The librarian introduced the first time that computers were applied in her library was 1999. She said: “at that time, computers were not as popular as today in China and only three computers were used in our library.” However, the main campus was rebuilt step by step from 2003 to 2004. The librarians mentioned: “since 2003, computers have been widely used in our library not only for the use of students and teachers but also for administrative purpose.”

When being asked whether she took the training of ICT skills before, the librarian answered: “Of course yes.” She complemented that at the beginning she was not adapted to the application of computers and felt stressed. Even after relevant training she still was unconfident at computers use. However, “with the frequent practice in
daily work and continuous regular training, now I am very skilled at computers operation,” said the librarian. The librarian thought that training had become an essential part of her job.

Furthermore, the librarian introduced the changes in the library after using computers. She said that the services provided by our library had been enriched. “We have set up a books-searching database system so that students and teachers are able to easily search what they want on computers available in the hall of our library and then go to the right place to get them… Besides, we manage books and account information through an automatic database system that was especially designed for our library… We also provide a lot of electronic materials and databases online… But meanwhile, the traditional services are also kept,” answered the librarian.

4.4.3 Changes of Librarians’ Roles

When being asked whether she helped students who were using computers for the first time, the librarian said: “Yes, I often help them.” She also told that in fact she not only assisted students with using computers but also with how to use the database system to search books. Sometimes she even taught students how to use the other ICT facilities such as printers. “Many students don’t know how to use such system because it is new to them and most students even know little about the search strategy,” supplemented she.

The librarian also described the changes of her roles in learning support. In her opinion, before ICT was applied in the library, the only role of her was to provide information to students and teachers, while now in addition to this role she should also guide students and teachers to use ICT facilities and courseware. “I accepted ICT training from the other experts. When back to my job, I become a trainer to help students and teacher adapted to the ICT environment,” commented the librarian.

Finally, the librarian mentioned that everything had its convex and concave. “It is
really hard to judge whether ICT made my work easier or more difficult…once ICT made me nervous and does bring more duties to my job, but after training, I can handle the routine issues more correctly and efficiently via computers and the database system,” said she.

The questions of this interview are attached to this dissertation as Appendix 4.

4.5 Discussion

Based on the above data coming from the questionnaire and interviews, a clear picture could be drawn about the situation of ICT infrastructure and application in the education of Shanghai Tongji University as well as its impact on library use and the roles of librarians in learning support. The following sections will discuss about the findings at large.

4.5.1 ICT Infrastructure

The interviewed students introduced the background of ICT application in China education from various points of view. After making them up, it is found that since 2000 ICT infrastructure has been constructed in university and senior high schools, and ICT application in China education has gradually popularized.

ICT infrastructure in Shanghai Tongji University has been dramatically developed since 2000, especially in recent years. At present, great achievements have been gained, while still a few pitfalls require to be enhanced.

Since the four campuses of this university were set up in different year, there are apparent gaps among them in terms of ICT infrastructure. Huxi Campus and Jiading Campus, respectively newly built in 2000 and in 2004, enjoy far better condition of ICT infrastructure, while the main campus, as the most important campus of this university, rebuilt its ICT facilities from 2003 and now also enjoys a high level of
ICT infrastructure. Generally speaking, the level of ICT infrastructure in Jiading Campus ranks highest and the next are Huxi and Main Campus whose levels are similar. Hudong Campus enjoys the poorest ICT infrastructure, far behind the other three campuses. But every campus has paid much attention to the management of ICT infrastructure and assigns specialized teachers to maintaining the ICT facilities.

Tongji University has done well in campus network constructing. Every campus has built a campus network early or late since 2000. Each campus network is connected to WWW and the Internet and covers the classrooms, offices, university library, public computer rooms and dormitories. However, the quality of network in Hudong Campus is too poor to well support education with extremely slow speed.

Besides, Main Campus, Jiading Campus and Huxi Campus enjoy better condition than that of Hudong Campus in terms of the quantity and quality of computers in classrooms, offices, university library and public computer rooms. The computers of the former three campuses can well meet the demands of students and teachers, while the computers in Hudong Campus are too poor to sufficiently satisfy the education needs. On the other hand, it is discovered that the computer-per-student ratio is 9:10, which is not low compared with the developed countries where every student has one or more computers according to Hepp (2004).

As for the other facilities such as printers, scanners and fax, it is easily found that most ICT facilities are available to teachers in offices but the quantities of these devices differ from one campus to another. Main Campus and Jiading Campus provide a lot of, while Huxi Campus supplies fewer compared with the former two campuses. Hudong Campus offers the least ICT facilities. However, the situation is quite disappointing when referring to the availability of these facilities to students. Only the library and public computer rooms in Jiading Campus offer enough printers, scanners and faxes to students. There is no or few provision of these ICT devices to students in libraries, public computer rooms as well as in department computer
rooms in the rest three campuses. But all these ICT devices in libraries, offices and public computer rooms are free to students and teachers.

Moreover, it is discovered that in the Main Campus and Jiading Campus, all the classrooms have one data projector, while most classrooms have a data projector in Huxi Campus and Hudong Campus. None of the four campuses has overhead projectors. A clearer picture regarding the use of overhead projector and data projector is gained from the questionnaire. The majority responders chose data projector and blackboard to be the always and usually used devices to present lecture handouts, and overhead projector and paper to be rarely and never used devices. Data projector and blackboard were also chosen by the major people to be two most often used devices in class, while the two least often used devices are paper and overhead projector. It completely indicates that paper and overhead projector are eliminated out of class. Instead data projector as one of the advanced ICT devices has been widely and frequently used in class, together with blackboard.

4.5.2 ICT Application

It is obvious that ICT has taken an active part in the education of Shanghai Tongji University where the computers are known to be mainly used for teaching and learning purposes. In some cases they also serve for administrative purposes and communication purposes, but these two applications are not so wide as the above two. It is also found that among the communication methods between teachers and students including email, telephone, online BBS, online chatrooms, chat tools and face-to-face talk, face-to face talk is frequently used by the most people and the next is email. The reason may lie in that the university provides free university web mail to both students and teachers and the four campuses of the university are dispersed in different areas in Shanghai. However, not so many people use online BBS, online chatrooms and chat tools as communication ways, which indicates ICT has not been fully utilized in the communication of Tongji University.
The table and diagram of question 6 in the questionnaire shows that computer and Internet are very frequently utilized, above 8 hours per day, for the purpose of learning and teaching. As a result, there is no surprise when it is found from the question 12 in the questionnaire that people prefer to use online search engine and go to the library to attain information rather than use electronic resources on the library’s homepage. Besides, it is also discovered from the diagram of question 11 in the questionnaire that the frequency of visit university library’s homepage is lower than that of going to the library. People most chose once per month for visiting library’s homepage and once or twice per week for going to the library. University library homepage in Tongji University seems not to function well enough, though every campus has a library and the library homepage offers many services and electronic resources to both students and teachers. What an interviewee said indicates that the problem lie in that these electronic resources aren’t popularized among students and teachers who are not familiar with them and even don’t know how to use them. Though the interviewed librarian pointed out one of her job was to guide students and teachers how to use the new books-searching system and electronic databases for the first time in the library, there are still a large number of students and teachers who doesn’t go to the library and can’t accept such guide. Training should be particularly given regarding how to search in e-databases and library catalogue, and how to operate some not widely used ICT facilities.

The question 9 in the questionnaire provides the situation of the application of some other ICT devices. The majority responders always use operation system and application system in their learning and teaching, which indicates that operation system and application software hold an extremely significant position in education. Printer is another important ICT devices in education and said to be usually used by almost half of the responders. On the opposite, those devices including PDA, scanner and fax are rarely and even never used by the majority responders in learning and teaching. However, this doesn’t represent they are not helpful or important in education. Such situation may be caused by that the university doesn’t offer PDA,
and scanners and faxes are only available to teachers in most campuses of Tongji University.

Speaking of the web pages of modules, the pie chart of question 13 in the questionnaire indicates that the majority of responders claimed *a few (<50%) or none* of their modules had relevant web pages, which shows that ICT hasn’t been widely applied in this aspect. The web pages of modules usually offer such information and services as module outline, lecture handouts, useful links of online resources, online submission of the coursework and BBS. Chatrooms are seldom included. As to the homepage of department, there are still 10.2% responders announcing their departments have no homepages. However, the existent department homepages supply relatively complete and comprehensive information and services which consist of department introduction, course introduction, learning and teaching resources, meeting notice, career information and so on. It can conclude that the application of ICT in this aspect has been developed to some extent, but there’s still a large space that can be explored.

Finally, it is detected that the remote education has been established in Shanghai Tongji University and has been fully developed recently. It has possessed its own department homepage to publish large quantities of relevant information and offer online services to students and teachers.

### 4.5.3 ICT Skills and Training

The situation of ICT training for teachers is not so satisfactory. None of the 12 teachers who replied to the questionnaire has ever accepted any ICT trainings. However, the ICT trainings for students are more sufficient. The majority responders received the training of such common ICT skills as word processing, spreadsheets and making presentation materials and a few received the training of relatively difficult ones including programming, database and drawing by use of computers. As to the training for librarians, the interviewed librarian confessed that formal training
improved their ICT skill and enabled them adapted to ICT environment and more confident to work in such an environment.

As to the adopted ICT skills, the major responders adopt many common skills including keyboard operation, mouse operation, word processing, e-mail exchange, web surfing and data retrieval in learning and teaching. Spreadsheets and making presentation materials (PowerPoint) are also utilized by most people, while less persons adopted these relatively difficult skills such as programming, database, drawing by use of computers and setting up sites. The diagram of the fourth question in the questionnaire also indicates the average level of computer ability of students and teachers in Tongji University is relatively high because the majority students and teachers are intermediate or experienced at computer operation.

4.5.4 Attitude towards ICT Application Level
The most of responders give 4 in one to five scales to evaluate ICT application in Tongji University, while the next most responders give 3. The sum of these two responses is as high as 71.2%, which indicates that Tongji University enjoys a medium level of ICT application in its learning and teaching.

4.5.5 Impact of ICT on Education
From the diagrams of question 21, 22 and 23, it is safe to conclude that the absolute majority responders welcome the ICT application in education. They believe ICT offers faster access to information, more abundant information resources, geographically unlimited communication, and makes study more convenient and efficient than ever before. Nevertheless, some interviewees put forward the opposite opinions. They think ICT reduces the opportunities of face-to-face communication between people, which may lead to the decline of personal interaction among people. Moreover, ICT brings challenges both to teachers and students who are required to master more ICT skills through periodic training.
4.5.6 Attitude towards Library
The answers to question 24, 25 and 26 in the questionnaire reveal that a great number of responders believe that library is important to their learning and teaching to different extent and it is absolutely necessary to exist. Responders supplied sufficient reasons to explain why ICT could not replace the library, which demonstrates the significant value of library in education. Although there are opponent opinions from those who think library is not necessary to exist if ICT is able to supply all the information required, these opponent opinions are overwhelmed by the supportive reasons. The Internet and ICT cannot replace the library because library is not only an information provision center but also an appropriate study place for students. As one responder suggested, online materials and those provided by libraries could well complement each other.

4.5.7 Impact of ICT on Library Use
From the interviews with students, it is found that ICT application in libraries brings about great convenience for students and teachers who used to spend considerable time on physically and aimlessly searching books in library. But now they can search in the databases system to find whether the materials they need exist in the library. Sometimes they can even expediently get what is required from the electronic databases on library homepage instead of going to the library so that a great amount of time is saved.

4.5.8 Impact of ICT on the Roles of Librarians
Through the interview with a librarian, it is discovered that the roles of librarians are not changed but added. In addition to provide information and traditional services, the librarian should also offer guide to teachers and students regarding how to use ICT hardware and software in the library. Actually, more duties are introduced to the librarians due to the introduction of ICT. However, now librarians can more precisely and efficiently handle various issues in work with ICT.
4.6 Summary and Conclusions

This chapter analyses the data collected from the questionnaire survey and interviews with students and librarians, after which the results gained from these data are discussed. The results cover all the aspects including ICT infrastructure and application, ICT skills training, attitude towards library and the impact of ICT on library use and the librarians’ roles as well. Some findings are put together to support each other; the others are listed independently.

The construction of ICT infrastructure in learning and teaching has been greatly developed in Tongji University since 2000. Nevertheless, there is apparent regional gap among the four campuses with regard to ICT infrastructure. ICT has also been widely applied to learning and teaching in Tongji University Computers and the Internet are frequently used mainly for learning and teaching, but not so often for administrative purposes and communication purpose. A few modules and most departments have their own homepage to provide online information and services. However, such application and services could be extended to a wider scope via courseware. Moreover, remote education has been established and normalized via ICT in Shanghai Tongji University that set up a remote education department and its homepage. Till now, a basic framework has been formed for remote education.

Because of ICT application in library, the library supplies extra online services based on those traditional ones. However, in Shanghai Tongji University, many students and teachers who prefer to go to the library and use online search engine than use electronic resources on it. Such services as library catalogue and electronic databases should be popularized among teachers and students and user guide should be offered. ICT application also influences the roles of librarians who now become an information provider and ICT use guider after adequate trainings.

ICT brings advantages and disadvantages to the education in Tongji University.
While enjoying the convenience and efficiency ICT provided, students and teachers should be also alert to the challenges resulted from ICT. Tongji University should actively offers trainings to students, librarians and especially teachers.
Chapter 5: Conclusions

5.1 Introduction

In conclusion this research has afforded a beneficial insight into how ICT has been applied to China general higher education and how the roles of librarians have been shifted due to the introduction of ICT. This investigation has taken into account the construction of ICT infrastructure in universities, ICT application in higher education, ICT impact on library and the changes in librarians’ roles in learning support caused by ICT. The study also reveals that ICT has brought an array of benefits to China general higher education, libraries and librarians, together with a few inevitable negative effects.

5.2 Summary of Main Conclusions

- Main achievements have been gained on the construction of ICT infrastructure that is still rapidly proceeding on a national scale.
- Huge quantities of computers and high quality networks with bandwidth are available in most universities. About 70% of all the universities have established campus networks connected to the Internet.
- The facilities such as printers, scanners, faxes are seldom used in learning and teaching, and are rarely provided by universities, especially to students.
- The application of ICT in China education is expanding swiftly.
- The ICT software has been applied to education to some extent. Many universities have developed an educational resource warehouse for materials such as web-based courses and other courseware.
- Almost all the departments in universities have set up homepages, but only a few modules have homepages to supply online services and share electronic materials between students and teachers by use of courseware.
- Multimedia has been introduced to conventional classrooms to enable the exchange of instructional information between teachers and students. Data projectors, together with blackboard are widely and frequently used in class,
while overhead projectors and paper almost disappear in class.

- Teachers and students have personal computers at home and in schools. Particularly, almost every student has a personal computer in universities.
- Computers are frequently used for teaching and learning purposes in universities. The ICT application to administrative management and communication in universities has some progress and should be promoted.
- Such useful software as online BBS, online chatrooms and chat tools has not been, but should be broadly used in education as one of communication ways.
- Many easy ICT skills are commonly used by students and teachers in education, while some difficult ones remain to bepopularized.
- Regional gaps are severe between central cities and rural areas as well as between newly built and old institutions in China. There are three distinct levels of ICT application in China education.
- Different impacts of ICT have been exerted on education including improving quality and equity of education, providing faster access to information and making education more convenient and efficient than ever before.
- ICT is a give to narrow down the gap of education between the developed and developing nations.
- ICT generates a new instructional mode—online education. In China, online education has been steadily developed and far more prosperous at present. A basic framework has been established for online education.
- Sufficient reasons support that library can’t be replaced by ICT.
- ICT is widely applied to libraries, which makes the library gradually shift to an information center and changes the way of library use.
- Some students and teachers prefer to use electronic resources provided by the library homepage, but others don’t. They should be further introduced and popularized among students and teachers to whom the relevant guide and training should also be offered.
- The librarians now play additional roles and take more responsibilities based on the traditional ones since the introduction of ICT. Their new advanced roles
mainly consist of educator/facilitator, net navigator, information creator, collector, consultant, provider and manager as well as evaluator.

- ICT training is a crucial factor of ICT application in China education. It allows students, teachers and librarians to be adapted to the ICT environment and to achieve personal development, while without it the ICT application level may be restricted.
- ICT training has been given to the majority students and librarians, while few teachers have received trainings regarding how to integrate ICT into classrooms. More opportunities should be widely offered to teachers to receive ICT training.

5.3 Problems of China ICT Education

According to Li (2005), although in recent years great progress has been achieved in the ICT application in China education due to the persistent efforts of the Chinese government, there still exist some constraints on ICT use, which holds up the advancement of ICT application in China education. Li (2005) summarized these problems into the following points:

- Lack of a clear and shared understanding of informationisation
- The deficiency of the investment in educational informationisation and the imbalance of the development in different areas
- Difficult to integration of ICT into education due to the lack of education resources and sound application methodology
- The demand for people who are skilled in ICT
- The constraints of the education informationisation facilities in universities and elementary schools
- The immaturity of the educational ICT industry

The Chinese government has undertaken some actions trying to solve these problems according to Li (2005). They encompass the following issues:

- Constructing infrastructure for an information environment.
- Developing educational resources.
● Encouraging computer education.
● Supporting teacher professional development.
● Integrating ICT into traditional classrooms.
● Delivering good educational resources into rural areas using ICT-assisted distance education methods.
● Changing administration systems through ICT application.

5.4 Development Tendency of ICT in China education

Tang (2003) pointed out many education experts and staff in Chinese government were seriously considering about the development tendency of China ICT education in the future, which mainly contains the following aspects, found through literature review:

● The government and educational institutions will pay more attention to enhance the ICT training for teachers to boost their ICT ability and skills, which is the precondition of integrating ICT into class without impediments.
● The teachers, as a major part in education, will be tremendously encouraged to integrate ICT skills into class practice, after appropriate ICT training.
● More funds will be invested not only to explore new technologies, forms and opportunities that ICT could further lend to traditional and online education but to develop courseware and digital materials as well.
● International exchange and mutual learning regarding ICT application in education will be enhanced among all the countries in the world, while the relevant knowledge will be shared among them.
● The construction of ICT infrastructure, as the foundation of ICT education, will be expanded to every area around China and the quality of ICT facilities will be enhanced.
● The integration of ICT into education is too complicated and expensive for the government to implement by itself so that the Chinese government will cooperate with private corporations and build up a long-term cooperation.
relationship between them to carry out the China educational informationisation together.

- Online education will be continuously promoted and popularized around China. To completely realize it, international standards of online education will be developed, which improves the chances of acquiring information and educational materials.

### 5.5 Research Limitations

In terms of the research limitations of this study, both the restricted time period to conduct the research and the geographic constraints play a major role. Given more time, this research would have carried out interviews with teachers and other administrative staff to get more detailed information about ICT application and ICT training from their perspectives. This would have uncovered the ICT policies of Shanghai Tongji University and their plans to further apply ICT to education. Besides, if more librarians at management level were interviewed, the study would have obtained extra points of view so as to provide a more complete and clearer picture of the ICT impact on the librarians’ roles. Finally, the study would have benefited a lot, if a field survey had been conducted in Shanghai Tongji University and in the universities on a national scale, at least in several different regions. Much more precise data would have been attained as to the ICT infrastructure construction and application, which could have helped acquire a more valued picture.

### 5.6 Issues for Further Research

In the literature review, questionnaire survey and the interviews carried out for this research, a variety of opinions and problems appeared. However, it’s impossible for this research to investigate in depth every issue and problem raised during the study process, which leaves great space for further researches. They cover the following issues:

- To what extent does the regional gaps of ICT infrastructure and application exist
between the central cities and the rural areas?

- What is the average level of the ICT skills of teachers and students? Is this level enough for ICT application into education?
- What are the initiatives and purposes to apply ICT into education?
- What should be done after students and teachers have acquired the necessary ICT skills and the construction of ICT infrastructure has been implemented?
- How has ICT affected the management of library?

These are only some potential topics for future researches. Due to the limitation of words, there are still lots of issues uncovered. Wish these topics could be a primary guide to those who are interested in the field of ICT education in China.
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-82-
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Appendix 1

Questionnaire

Information and Communication Technologies (ICT) Application in

Education of Shanghai Tongji University

Information Management

University of Sheffield

13.07.2005

Instruction
This questionnaire aims at the ICT application in the education of Shanghai Tongji University and its impact on the traditional role of the librarians in learning support.

Please fill one or more answer according to the directions. For the fill in blanks, Chinese can be used if it is more convenient for you. Please make the answers easily be understood.

All the personal information in this questionnaire is regarded to be strictly confidential. More details please see Information Sheet. http://survey.perseus.com/f6c0da.htm

Noun Explanation
ICT (Information and Communication Technologies) refers to the hardware and software, which consists of computers, scanners, printers, bandwidth, information infrastructure, operation system, application tools, courseware, BBS, E-mail, telephones, television, fax, and even local and wide area network including Internet.

I. Personal Information

1. You are _____ in Shanghai Tongji University. (Please fill in only one choice)
   a) a teacher
   b) an undergraduate student
   c) a master student
   d) a PhD student

2. Your age is ____. (Please fill in only one choice)
   a) 20-25
3. Which campus do you stay in? Please fill in: ________________________

4. Which level would you like to address your ability of computer operation? ______
(Please fill in only one choice)
   a) Novice
   b) Intermediate
   c) Experienced
   d) Expert

II. ICT Infrastructure & ICT Application
(All the questions aim at the current situation of the campus you stay at)
5. If you are a student, please answer: how many computers and people are there in your dormitory? (Please fill in)

<table>
<thead>
<tr>
<th>Computers</th>
<th>Students</th>
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</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

6. What are the computers in your campus mainly used for? ______
(Multiple choice)
   a) Didactical use by teachers such as to make teaching materials
   b) Communication purposes
   c) Administrative purposes
   d) Classroom use by students
   e) Others (please fill in): _________________________________

7. How often do you use the computers and the Internet to assist your study or
teaching? (Please fill in only one choice in each column)

<table>
<thead>
<tr>
<th></th>
<th>Computers</th>
<th>Internet</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Above 8 hours per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Around 5-7 hours per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Around 2-4 hours per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Under 2 hours per day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) Others</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. How often do teachers use the following devices to present your lecture handouts? (Please fill in only one choice in each column)

<table>
<thead>
<tr>
<th></th>
<th>Blackboard</th>
<th>Overhead projector with slides</th>
<th>Data projector with PowerPoint</th>
<th>Paper</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Always</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Usually</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Sometimes</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Rarely</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) Never</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

9. Please rank the following devices in priority order from being most often used to the lowest often in class. __________________________________________________________________________
   a) Blackboard
   b) Overhead projector with slides
   c) Data projector with PowerPoint
   d) Paper

10. How often do you use the following devices for the purpose of studying or teaching? (Please fill in only one choice in each column)

<table>
<thead>
<tr>
<th></th>
<th>PDA</th>
<th>Scanners</th>
<th>Printers</th>
<th>Fax</th>
<th>Operation System</th>
<th>Application software</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Always</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Usually</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>c) Sometimes</td>
<td></td>
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<tr>
<td>d) Rarely</td>
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<td></td>
</tr>
<tr>
<td>e) Never</td>
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</tr>
</tbody>
</table>
11. If there exist a library in your campus and the library have a homepage, please answer: how often do you visit the university library’s homepage and go to the library for the purpose of studying or teaching? (Please fill in only one choice in each column)

<table>
<thead>
<tr>
<th>Visit university library’s homepage</th>
<th>Go to the library</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Every working day</td>
<td></td>
</tr>
<tr>
<td>b) Three or four times per week</td>
<td></td>
</tr>
<tr>
<td>c) Once or twice per week</td>
<td></td>
</tr>
<tr>
<td>d) Once two weeks</td>
<td></td>
</tr>
<tr>
<td>e) Two or three times per month</td>
<td></td>
</tr>
<tr>
<td>f) Once per month</td>
<td></td>
</tr>
<tr>
<td>g) Others</td>
<td></td>
</tr>
</tbody>
</table>

12. Which are the major resources to attain the materials and information you need in your study or teaching? ______ (Multiple choice)
   a) Search on Internet by search engine such as Google
   b) Electronic resources existing on the library’s homepage (If there exists any)
   c) Physically search in the library
   d) Others (please fill in): __________________________

13. Do the modules you take have their own homepages set up by the module leaders in your Department to offer the relevant module information? ______ (Please fill in only one choice)
   a) All
   b) Most (>50%)
   c) A few (<50%)
   d) None (if none, please go to question 14)

14. What information and services do the web pages provide? _____
(Multiple choice)
a) Module outline  
b) Lecture handouts  
c) Reading lists  
d) Assignments introduction  
e) Assessment  
f) Useful links of online resources  
g) BBS (discussion board)  
h) Chatrooms  
i) Online submission of the coursework  
j) Opinion poll

15. Does your Department have a homepage? _____ (Please fill in only one choice)  
a) Yes  
b) No (if no, please go to question 16)

16. What information and services does the homepage of Department provide?  
_____ (Multiple choice)  
a) Department introduction  
b) Course introduction  
c) Research introduction (e.g. PhD research projects)  
d) Contact Details (e.g. staff listing, staff communications, Department address and communications including email, telephone, fax number, etc.)  
e) Learning and teaching resources (e.g. semester arrangement, timetable, lecture handouts downloads)  
f) Career information  
g) Other links (please fill in): ________________________________

17. What are the most frequently used communication ways between the teachers
and the students? ____ (Multiple choice)

a) Email  
b) Telephone  
c) Online BBS (discussion board)  
d) Online Chatrooms  
e) Chat tools (e.g. Msn, QQ)  
f) Face-to-face talk

III. ICT Skills and Training

If you are a teacher, please answer question 18. Otherwise, go to question 19.

18. Are you given any opportunities to learn how to integrate computers and ICT skills into your classroom practice? ____ (Please fill in only one choice)

a) Yes  
b) No

19. What kinds of ICT skills have you ever been trained for and have you adopted in your study or teaching? (Multiple choice)

<table>
<thead>
<tr>
<th>Trained ICT skills</th>
<th>Adopted ICT skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Keyboard operation</td>
<td></td>
</tr>
<tr>
<td>b) Mouse operation</td>
<td></td>
</tr>
<tr>
<td>c) Word processing (e.g. Msword)</td>
<td></td>
</tr>
<tr>
<td>d) E-mail exchange</td>
<td></td>
</tr>
<tr>
<td>e) Web surfing</td>
<td></td>
</tr>
<tr>
<td>f) Data retrieval</td>
<td></td>
</tr>
<tr>
<td>g) Drawing by use of computers</td>
<td></td>
</tr>
<tr>
<td>h) Spreadsheets (e.g. Excel)</td>
<td></td>
</tr>
<tr>
<td>i) Setting up sites</td>
<td></td>
</tr>
<tr>
<td>j) Programming</td>
<td></td>
</tr>
<tr>
<td>k) Database</td>
<td></td>
</tr>
<tr>
<td>l) Making presentation materials</td>
<td></td>
</tr>
<tr>
<td>m) Others</td>
<td></td>
</tr>
</tbody>
</table>
IV. Attitudes

20. On a scale of 1 to 5, how would you rate the application of ICT in your university?  
______ (Please fill in only one choice)  
a) 1 to poor  
b) 2  
c) 3  
d) 4  
e) 5 to excellent

21. What is your attitude toward the application of ICT in the education?  
______ (Please fill in only one choice)  
a) Extremely like  
b) Very like  
c) Somewhat like  
d) Indifferent  
e) Somewhat Dislike  
f) Very dislike  
g) Hate

22. Do you think that ICT offers the faster access to information for your learning and teaching?  
______ (Please fill in only one choice)  
a) Yes  
b) No

23. Do you think that the application of ICT makes your study or teaching more convenient and efficient?  
______ (Please fill in only one choice)  
a) Yes  
b) No
24. If all the materials and information required in your study and teaching are available online, do you think that the existence of libraries is necessary? ____

(Please fill in only one choice)

a) Yes  
b) No

25. Please explain why do you think so?

________________________________________________________________________

________________________________________________________________________

26. How important are the libraries for learning and teaching in your opinion? ____

(Please fill in only one choice)

a) Very important  
b) Somewhat important  
c) Not very important  
d) Not important at all

This is the end of QUESTIONNAIRE. Thank you very much for your generous cooperation! Please send this back to the sender—Jiani Wu.

The sender’s communications:

Email: prince.wjn@gmail.com

prince_wjn@hotmail.com

prince_wjn@yahoo.com.cn
### Appendix 2

#### Responses

1. 

<table>
<thead>
<tr>
<th>Label</th>
<th>Teacher</th>
<th>Undergraduate Student</th>
<th>Master Student</th>
<th>PhD Student</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>12</td>
<td>55</td>
<td>32</td>
<td>19</td>
<td>118</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>10.2%</td>
<td>46.6%</td>
<td>27.1%</td>
<td>16.1%</td>
<td>100%</td>
</tr>
</tbody>
</table>

2. 

<table>
<thead>
<tr>
<th>Label</th>
<th>20-25</th>
<th>26-30</th>
<th>31-40</th>
<th>41-50</th>
<th>Above 50</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>87</td>
<td>19</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>118</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>73.7%</td>
<td>16.1%</td>
<td>4.2%</td>
<td>3.4%</td>
<td>2.6%</td>
<td>100%</td>
</tr>
</tbody>
</table>

3. 

<table>
<thead>
<tr>
<th>Label</th>
<th>Main Campus</th>
<th>Hudong Campus</th>
<th>Huxi Campus</th>
<th>Jiading Campus</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>38</td>
<td>28</td>
<td>27</td>
<td>25</td>
<td>118</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>32.2%</td>
<td>23.7%</td>
<td>22.9%</td>
<td>21.2%</td>
<td>100%</td>
</tr>
</tbody>
</table>

4. 

<table>
<thead>
<tr>
<th>Label</th>
<th>Novice</th>
<th>Intermediate</th>
<th>Experienced</th>
<th>Expert</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>10</td>
<td>61</td>
<td>40</td>
<td>7</td>
<td>118</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>8.5%</td>
<td>51.7%</td>
<td>33.9%</td>
<td>5.9%</td>
<td>100%</td>
</tr>
</tbody>
</table>

5. 

<table>
<thead>
<tr>
<th>Count of Computers</th>
<th>Count of Students</th>
<th>Computers Per Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>413</td>
<td>488</td>
<td>0.9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total Responses</th>
<th>118</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count of Dormitories in which everyone has a computer</td>
<td>80</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>67.8%</td>
</tr>
</tbody>
</table>
6. (Multiple Choices)

<table>
<thead>
<tr>
<th>Label</th>
<th>Count</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Didactical use by teachers such as to make teaching materials</td>
<td>107</td>
<td>90.7%</td>
</tr>
<tr>
<td>Communication purposes</td>
<td>65</td>
<td>55.08%</td>
</tr>
<tr>
<td>Administrative purposes</td>
<td>81</td>
<td>68.6%</td>
</tr>
<tr>
<td>Classroom use by students</td>
<td>90</td>
<td>76.3%</td>
</tr>
<tr>
<td>Others</td>
<td>1</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

Others: Students used in leisure time.

7.

<table>
<thead>
<tr>
<th>Label</th>
<th>Above 8 hours per day</th>
<th>Around 5-7 hours per day</th>
<th>Around 2-4 hours per day</th>
<th>Under 2 hours per day</th>
<th>Others</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>Computers</td>
<td>Internet</td>
<td></td>
<td></td>
<td></td>
<td>118</td>
</tr>
<tr>
<td></td>
<td>57</td>
<td>46</td>
<td>33</td>
<td>24</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Percentage</td>
<td>Computers</td>
<td>Internet</td>
<td></td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>48.3%</td>
<td>39.0%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>28.0%</td>
<td>28.8%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8.

<table>
<thead>
<tr>
<th>Label</th>
<th>Always</th>
<th>Usually</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blackboard</td>
<td>Count</td>
<td>25</td>
<td>53</td>
<td>31</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Percentage</td>
<td>21.2%</td>
<td>44.9%</td>
<td>26.3%</td>
<td>3.4%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Overhead projector</td>
<td>Count</td>
<td>0</td>
<td>17</td>
<td>32</td>
<td>36</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Percentage</td>
<td>0.0%</td>
<td>14.4%</td>
<td>27.1%</td>
<td>30.5%</td>
<td>28.0%</td>
</tr>
<tr>
<td>Data projector</td>
<td>Count</td>
<td>20</td>
<td>69</td>
<td>27</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Percentage</td>
<td>17.0%</td>
<td>58.5%</td>
<td>22.9%</td>
<td>0.8%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Paper</td>
<td>Count</td>
<td>0</td>
<td>5</td>
<td>24</td>
<td>50</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Percentage</td>
<td>0.0%</td>
<td>4.2%</td>
<td>20.3%</td>
<td>42.2%</td>
<td>33.1%</td>
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</tbody>
</table>

93
9.

<table>
<thead>
<tr>
<th>Label</th>
<th>Most Often Used</th>
<th>Least Often Used</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Count</td>
<td>Percentage</td>
</tr>
<tr>
<td>Blackboard</td>
<td>48</td>
<td>40.7%</td>
</tr>
<tr>
<td>Overhead projector</td>
<td>8</td>
<td>6.8%</td>
</tr>
<tr>
<td>Data projector</td>
<td>61</td>
<td>51.7%</td>
</tr>
<tr>
<td>Paper</td>
<td>1</td>
<td>0.8%</td>
</tr>
<tr>
<td><strong>Total Responses</strong></td>
<td><strong>118</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

10.

<table>
<thead>
<tr>
<th>Label</th>
<th>PDA</th>
<th>Scanners</th>
<th>Printers</th>
<th>Fax</th>
<th>Operation System</th>
<th>Application software</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>0</td>
<td>5</td>
<td>12</td>
<td>3</td>
<td>102</td>
<td>87</td>
</tr>
<tr>
<td>Usually</td>
<td>1</td>
<td>4</td>
<td>56</td>
<td>3</td>
<td>15</td>
<td>28</td>
</tr>
<tr>
<td>Sometimes</td>
<td>1</td>
<td>21</td>
<td>40</td>
<td>17</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Rarely</td>
<td>21</td>
<td>60</td>
<td>5</td>
<td>46</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Never</td>
<td>95</td>
<td>28</td>
<td>5</td>
<td>49</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total Responses</strong></td>
<td><strong>118</strong></td>
<td><strong>118</strong></td>
<td><strong>118</strong></td>
<td><strong>118</strong></td>
<td><strong>118</strong></td>
<td><strong>118</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Label</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PDA</td>
</tr>
<tr>
<td>Always</td>
<td>0.0%</td>
</tr>
<tr>
<td>Usually</td>
<td>0.8%</td>
</tr>
<tr>
<td>Sometimes</td>
<td>0.8%</td>
</tr>
<tr>
<td>Rarely</td>
<td>17.8%</td>
</tr>
<tr>
<td>Never</td>
<td>80.5%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>
11. 

<table>
<thead>
<tr>
<th>Label</th>
<th>Count</th>
<th>Go to the library</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every working day</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>Three or four times per week</td>
<td>22</td>
<td>31</td>
</tr>
<tr>
<td>Once or twice per week</td>
<td>25</td>
<td>32</td>
</tr>
<tr>
<td>Once two weeks</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Two or three times per month</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td>Once per month</td>
<td>26</td>
<td>13</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Rarely</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Sometimes</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>When searching the books in the library</td>
<td>2</td>
<td>0</td>
</tr>
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<td><strong>Total Responses</strong></td>
<td>118</td>
<td>118</td>
</tr>
</tbody>
</table>

12. 

<table>
<thead>
<tr>
<th>Label</th>
<th>Search on Internet by search engine such as Google</th>
<th>Electronic resources existing on the library’s homepage</th>
<th>Physically search in the library</th>
<th>Others</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>114</td>
<td>60</td>
<td>74</td>
<td>3</td>
<td>118</td>
</tr>
<tr>
<td>Percentage</td>
<td>96.6%</td>
<td>50.8%</td>
<td>62.7%</td>
<td>2.5%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Others: From lecture handouts, books used in class.

13. 

<table>
<thead>
<tr>
<th>Label</th>
<th>All</th>
<th>Most (&gt;50%)</th>
<th>Few (&lt;50%)</th>
<th>None</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>7</td>
<td>21</td>
<td>65</td>
<td>25</td>
<td>118</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>5.9%</td>
<td>17.8%</td>
<td>55.1%</td>
<td>21.2%</td>
<td>100%</td>
</tr>
</tbody>
</table>
### 14.

<table>
<thead>
<tr>
<th>Label</th>
<th>Count</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Module outline</td>
<td>73</td>
<td>61.9%</td>
</tr>
<tr>
<td>Lecture handouts</td>
<td>73</td>
<td>61.9%</td>
</tr>
<tr>
<td>Reading lists</td>
<td>54</td>
<td>45.8%</td>
</tr>
<tr>
<td>Assignments introduction</td>
<td>70</td>
<td>59.3%</td>
</tr>
<tr>
<td>Assessment</td>
<td>44</td>
<td>37.3%</td>
</tr>
<tr>
<td>Useful links of online resources</td>
<td>65</td>
<td>55.1%</td>
</tr>
<tr>
<td>BBS (discussion board)</td>
<td>60</td>
<td>50.8%</td>
</tr>
<tr>
<td>Chatrooms</td>
<td>10</td>
<td>8.5%</td>
</tr>
<tr>
<td>Online submission of the coursework</td>
<td>65</td>
<td>55.1%</td>
</tr>
<tr>
<td>Opinion poll</td>
<td>21</td>
<td>17.8%</td>
</tr>
<tr>
<td><strong>Total Responses</strong></td>
<td><strong>93</strong></td>
<td></td>
</tr>
</tbody>
</table>

### 15.

<table>
<thead>
<tr>
<th>Label</th>
<th>Yes</th>
<th>No</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>106</td>
<td>12</td>
<td><strong>118</strong></td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>89.8%</td>
<td>10.2%</td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

### 16.

<table>
<thead>
<tr>
<th>Label</th>
<th>Count</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Department Introduction</td>
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<td>100.0%</td>
</tr>
<tr>
<td>Course Introduction</td>
<td>94</td>
<td>88.7%</td>
</tr>
<tr>
<td>Research Introduction</td>
<td>56</td>
<td>52.8%</td>
</tr>
<tr>
<td>Contact Details</td>
<td>72</td>
<td>67.9%</td>
</tr>
<tr>
<td>Learning and Teaching Resources</td>
<td>77</td>
<td>72.6%</td>
</tr>
<tr>
<td>Career Information</td>
<td>73</td>
<td>68.9%</td>
</tr>
<tr>
<td>Other Links</td>
<td>21</td>
<td>19.8%</td>
</tr>
<tr>
<td><strong>Total Responses</strong></td>
<td><strong>106</strong></td>
<td></td>
</tr>
</tbody>
</table>
17.

<table>
<thead>
<tr>
<th>Label</th>
<th>Email</th>
<th>Telephone</th>
<th>Online BBS</th>
<th>Online Chatrooms</th>
<th>Chat Tools</th>
<th>Face to face Talk</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>83</td>
<td>64</td>
<td>27</td>
<td>3</td>
<td>18</td>
<td>87</td>
<td>118</td>
</tr>
<tr>
<td>Percentage</td>
<td>70.3%</td>
<td>54.2%</td>
<td>22.9%</td>
<td>2.5%</td>
<td>16.1%</td>
<td>73.7%</td>
<td>100%</td>
</tr>
</tbody>
</table>

18.

<table>
<thead>
<tr>
<th>Label</th>
<th>Yes</th>
<th>No</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>0</td>
<td>12</td>
<td>12 (Teachers)</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>0.0%</td>
<td>100.0%</td>
<td>100%</td>
</tr>
</tbody>
</table>

19.

<table>
<thead>
<tr>
<th>Label</th>
<th>Trained ICT Skills</th>
<th>Adopted ICT Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>Percentage</td>
</tr>
<tr>
<td>Keyboard operation</td>
<td>81</td>
<td>68.6%</td>
</tr>
<tr>
<td>Mouse operation</td>
<td>82</td>
<td>69.5%</td>
</tr>
<tr>
<td>Word processing (e.g. Msword)</td>
<td>93</td>
<td>78.8%</td>
</tr>
<tr>
<td>E-mail exchange</td>
<td>81</td>
<td>68.6%</td>
</tr>
<tr>
<td>Web surfing</td>
<td>77</td>
<td>65.3%</td>
</tr>
<tr>
<td>Data retrieval</td>
<td>78</td>
<td>66.1%</td>
</tr>
<tr>
<td>Drawing by use of computers</td>
<td>68</td>
<td>57.6%</td>
</tr>
<tr>
<td>Spreadsheets (e.g. Excel)</td>
<td>93</td>
<td>78.8%</td>
</tr>
<tr>
<td>Setting up sites</td>
<td>69</td>
<td>58.5%</td>
</tr>
<tr>
<td>Programming</td>
<td>89</td>
<td>75.4%</td>
</tr>
<tr>
<td>Database</td>
<td>82</td>
<td>69.5%</td>
</tr>
<tr>
<td>Making presentation materials</td>
<td>83</td>
<td>70.3%</td>
</tr>
<tr>
<td>Others</td>
<td>3</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

20.

<table>
<thead>
<tr>
<th>Label</th>
<th>1 to poor</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5 to excellent</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>2</td>
<td>8</td>
<td>38</td>
<td>46</td>
<td>24</td>
<td>118</td>
</tr>
<tr>
<td>Percentage</td>
<td>1.7%</td>
<td>6.8%</td>
<td>32.2%</td>
<td>39.0%</td>
<td>20.3%</td>
<td>100%</td>
</tr>
</tbody>
</table>
21.  

<table>
<thead>
<tr>
<th>Label</th>
<th>Count</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely like</td>
<td>29</td>
<td>24.6%</td>
</tr>
<tr>
<td>Very like</td>
<td>30</td>
<td>25.4%</td>
</tr>
<tr>
<td>Somewhat like</td>
<td>35</td>
<td>39.0%</td>
</tr>
<tr>
<td>Indifferent</td>
<td>8</td>
<td>9.3%</td>
</tr>
<tr>
<td>Somewhat Dislike</td>
<td>1</td>
<td>1.7%</td>
</tr>
<tr>
<td>Very dislike</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Hate</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>Total Responses</strong></td>
<td>118</td>
<td></td>
</tr>
</tbody>
</table>

22.  

<table>
<thead>
<tr>
<th>Label</th>
<th>Yes</th>
<th>No</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>114</td>
<td>4</td>
<td>118</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>96.6%</td>
<td>3.4%</td>
<td>100%</td>
</tr>
</tbody>
</table>

23.  

<table>
<thead>
<tr>
<th>Label</th>
<th>Yes</th>
<th>No</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>110</td>
<td>8</td>
<td>118</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>93.2%</td>
<td>6.8%</td>
<td>100%</td>
</tr>
</tbody>
</table>

24.  

<table>
<thead>
<tr>
<th>Label</th>
<th>Yes</th>
<th>No</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>108</td>
<td>10</td>
<td>118</td>
</tr>
<tr>
<td>Percentage (%)</td>
<td>91.5%</td>
<td>8.5%</td>
<td>100%</td>
</tr>
</tbody>
</table>

26.  

<table>
<thead>
<tr>
<th>Label</th>
<th>Very Important</th>
<th>Somewhat Important</th>
<th>Not very Important</th>
<th>Not Important At All</th>
<th>Total Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>77</td>
<td>37</td>
<td>1</td>
<td>3</td>
<td>118</td>
</tr>
<tr>
<td>Percentage</td>
<td>65.3%</td>
<td>31.4%</td>
<td>0.8%</td>
<td>2.5%</td>
<td>100%</td>
</tr>
</tbody>
</table>
Appendix 3

Interview with Students

Information and Communication Technologies (ICT) Application in

Education of Shanghai Tongji University

Information Management

University of Sheffield

03.08.2005

Campus: ________________________
Title: _________________________
Department: __________________
Date: _________________________

Firstly, thank you for your time. I am an MSc Information Management student at the University of Sheffield. The interview is designed to investigate the current level of ICT application in your campus of Shanghai Tongji University and how it has had an impact on the education and the roles of librarians in your university. All the answers to the following questions will be strictly kept confidential and will only be used for the purpose of this study.

I. Personal Information

1. How long have your studied in Shanghai Tongji University?

2. How long have you used computers in learning and When began to use?

II. To determine the current situation of ICT infrastructure construction and ICT application in the educational system of Shanghai Tongji University

3. Is there any campus network in your campus? ______
   a) Yes
   b) No
4. When was the **campus network** introduced to your campus? _____

5. The **campus network** in your university covers the _____.
   (Multiple Choice)
   a) classrooms
   b) offices
   c) university library
   d) public computer rooms
   e) dormitories
   f) others: ________________________________

6. Does your campus have a library? _____
   a) Yes
   b) No

7. What resources does the library’s homepage provide?

8. Does the library in your campus have a library homepage? _____
   a) Yes
   b) No

9. How many **public computer rooms** does your campus have in all? Please describe about them in details?

   __________________________________________
   __________________________________________

10. Are the **public computer rooms** free to students and teachers?

11. How many **classrooms** and **offices** in your campus have computers? (One choice)
12. Generally speaking, how many computers does one *classroom*, *office*, *university library* and *public computer room* in your campus have? (One choice)

<table>
<thead>
<tr>
<th></th>
<th>Classrooms</th>
<th>Offices</th>
<th>University library</th>
<th>Public computer rooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Only one</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) 2 - 5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) 6 - 9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) 10 – 15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) 16 – 20</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>f) Others</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13. How many computers in the *classrooms*, *offices*, *university library*, *public computer rooms* and *dormitories* in your campus are connected to WWW and Internet? (One choice)

<table>
<thead>
<tr>
<th></th>
<th>Classrooms</th>
<th>Offices</th>
<th>University library</th>
<th>Public computer rooms</th>
<th>Dormitories</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) All</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Most (&gt;50%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) A few (&lt;50%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) None</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
14. Do the *offices, public computer rooms* and the *university library* in your campus consist of any of the following devices? (Multiple choice)

<table>
<thead>
<tr>
<th>Offices</th>
<th>University library</th>
<th>Public computer rooms</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Scanners</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Printers</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Fax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Others</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

15. How many classrooms in your university have an *overhead* projector or a *data* projector? (One choice)

<table>
<thead>
<tr>
<th>Overhead projector</th>
<th>Data projector</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) All</td>
<td></td>
</tr>
<tr>
<td>b) Most (&gt;50%)</td>
<td></td>
</tr>
<tr>
<td>c) A few (&lt;50%)</td>
<td></td>
</tr>
<tr>
<td>d) None</td>
<td></td>
</tr>
</tbody>
</table>

16. Does your university have any teachers who specialize in ICT and manage ICT infrastructure? ____
   a) Yes  
   b) No  
   c) Not sure

17. Does your university provide a university web mail for the students or the teachers? ____
   a) For the students only  
   b) For the teachers only  
   c) For both  
   d) For neither
18. Has your university offered a remote education via WWW (e-learning)?
   a) Yes
   b) No
   c) Not sure

III. To explore the impact of ICT on library use
19. What impact has ICT application in education exerted on library use?
20. Do you often use the electronic resources provided by the library’s homepage?
    Why or why not?

IV. To explore the impact of ICT on education
22. What impact has ICT brought to your learning? Any benefits or inconvenience?

Finally
Is there anything else that we have not covered but you would like to supplement or anything we have covered but you would like to expand on?
Appendix 4

Interview with Librarians

Information and Communication Technologies (ICT) Application in Education of Shanghai Tongji University

Information Management

University of Sheffield

04.08.2005

Job Title: ________________

Date: ________________

I. Personal Information

1. How long have you worked at the library of Shanghai Tongji University?

II. To determine factors involved in the application of ICT

2. When were computers introduced to the library?

3. Have you received sufficient computer training?

4. What has been changed after the application of computers?

III. To examine the changes in librarians’ roles

5. Have you helped students who are using the library’s computers and the other ICT facilities for the first time?

6. How has the application of computers influenced your roles in learning support?

7. Do you think computers has brought your more stress in job or made it easier for you?

Finally

Is there anything else that we have not covered but you would like to supplement or anything we have covered but you would like to expand on?