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# Library and Information Science Research in China—A Survey Based Analysis of 10 LIS Educational Institutes

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ABSTRACT

This paper aims to conduct a quantitative evaluation on the achievement, research productivity, and research hotspots of "Library, Information and Archives management" Science schools or departments in China. In this paper, the "LIS" in China is firstly defined. Before evaluation, data are collected from CSSCI (Chinese Social Science Citation Index)-indexed papers and SSCI (Social Science Citation Index)-indexed papers, as well as projects granted by the two authoritative national foundations in China, SSFC (National Social Science Foundation of China) and NSFC (National Natural Science Foundation of China). Then, a bibliometric-based method and a keyword-based method are employed to analyze the collected data from different perspectives, including annual distribution, author productivity, institute productivity and influence. Through the analysis, several conclusions are made: a) collaborative groups exist, though no particular collaboration preference is exhibited. b) Interdisciplinary research promotes the emergence of new disciplines. c) There are four top institutes with outstanding productivity and six hot research topics in the "LIS" study in China. Also, in a five-year period, "LIS" scholars have paid much attention on network technology and its application in this field. Research addressing the view of "information" is much more popular than the ubiquitous conception of "library". d) There still exist some issues in China's LIS research, for example, the unbalanced development of educational institutes, the excessive preference of theoretical research over technical research, etc.



## INTRODUCTION

Research has always been regarded as one of the main functions of modern universities world-wide. Kuhnen (1978) pointed out that, research conducted by professors increases the body of theoretical knowledge, as well as its application to practical problems. In the US, universities play a major role in originating and promoting the diffusion of knowledge and techniques that contribute to industrial innovation (Mansfield & Lee, 1996). The European Commission believes that, when treated equally, education, research and innovation form a so-called "knowledge triangle". Such a triad is embedded in the European Institute of Innovation and Technology (EIT) as a putative exemplar of a world-class university for the modern world (Boulton & Lucas, 2011). In mainland China, research is playing a much more important role in universities than ever before. It is believed that modern universities must target at least three basic missions: talent cultivation, social service provision and research. Among these missions, research achievements are always regarded as the primary criterion for university evaluation.

Research achievements could be evaluated from various aspects, such as patents, research reports, teaching innovation, papers, research projects, etc. A careful evaluation of periodical literature may indicate a complete picture of a discipline (Davarpanah & Aslekia, 2008), and "research projects" is another important factor in a discipline's development. As a result, analyses on both academic papers and research projects are commonly used in evaluating one institute's productivity. In this paper, we focus on the evaluation of the 10 Doctoral-degree-conferring Library and Information Science educational institutes in mainland China to summarize the periodical development of the Library and Information Science discipline in mainland China.

"LIS" is known as Library and Information Science. It is defined in different forms of internal conceptual coherence: some approve that "LIS" is an inter-discipline concept (Weech & Pluzhenskaia, 2005), while others treat it as a standalone discipline (Bawden, Weller, & Haider, 2007; Fadaie, 2008). As for mainland China, according to the classification in the "Catalogs of Disciplines for Professional Degree Commencement and Talent Cultivation", which is formulated by the Ministry of Education of the People's Republic of China in 2013 "library, information and archives management" is a sub-class of Management Science, containing

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0099-1333/

Library Science, Information Science, and Archives Management (see Appendix A). Therefore, from our perspective, "LIS" is more of an abbreviation referring to the "library, information and archives management" discipline.

In mainland China, there are over 70 LIS credential programs for graduate education. Among these programs, doctoral programs play a leading role in research. However, the number of Doctoral-degree-conferring LIS educational institutes is relatively small. According to the Academic Degree Committee of the State Council (ADCSC) of China, there are only 11 institutes certified as LIS doctoral degree conferring institutes (Table 1). 9 of the 11 institutes belong to universities, which are the School of Information Management, Central China Normal University (CCNU), the School of Management, Jilin University (JLU), the School of Information Management, Nanjing University (NJU), the Department of Information Resources Management, Nankai University (NKU), the School of Information Resource Management, Renmin University of China (RUC), the School of Information Management, Sun Yat-sen University (SYSU), the Department of Information Management, Peking University (PKU), the School of Information Management, Wuhan University (WHU), and the School of Public Management, Yunnan University (YNU). Also, one institute, the National Science Library, belongs to the Chinese Academy of Sciences (CAS). Besides, there is one institute belonging to a military college, the Nanjing Political College (NPC).

Specifically, till 2011, 8 educational institutes have been qualified by ADCSC for conferring doctoral degrees in Library Science, 8 in Information Science, and 4 in Archives Management (Qu, Zhao, & Qu, 2012). These institutes have certain advantages in their discipline's development, and are commonly regarded as leaders in China's LIS field. Therefore, in this paper, we selected 10 of them as samples for research, leaving the NPC out of our consideration, since relative data of this college are not publicly accessible.

The purposes of this paper are not only to help LIS practitioners understand the current status of research achievements of LIS educational institutes, but also to locate problems in current LIS research in China. In the following sections, we will give a productivity evaluation and analyze the current development of LIS in China taking the 10 sample LIS institutes as examples. The evaluation is conducted based on academic papers and research projects. More specifically, it contains: a) assessment on changes in the research productivity of 10 Chinese LIS programs over time; b) rankings of the top 50 scholars in terms of their research output, and their institute distribution; c) rankings of the top 50 scholars in those LIS programs in terms of their impact; d) rankings of the 10 sample LIS programs in terms of their research output; and e) rankings the 10 sample LIS programs in terms of their impact. Besides, this paper also proposes a keyword analysis method, which identifies and ranks the keywords that most frequently occur in papers published by authors in the 10 LIS programs. With this method, core keywords could be extracted and ranked separately from all the publications of the 10 LIS programs during 2008 and 2012. The results of this analysis can be treated as a supplementary to highlight research concentrations of the 10 LIS programs. As for problem locating, data analysis with background consideration and research theme analysis of literature or projects are employed. This could contribute to the future policy-making in China's LIS research. Furthermore, a comparison on research achievements between iSchool members based on our previous work (Xiao & Li, 2012) and other institutes is given, which could serve as another reference for policy-making.

**Table 1**
List of all 11 LIS educational institutes qualified for conferring LIS PhD degrees in mainland China, and their corresponding PhD degrees conferring disciplines till 2011.

| Institute | Library science | Information science | Archives management |
|---|---|---|---|
| CAS | √ | √ | – |
| CCNU | – | √ | – |
| JLU | √ | √ | – |
| NJU | √ | √ | – |
| NKU | √ | √ | – |
| NPC | √ | – | √ |
| RUC | – | √ | √ |
| SYSU | √ | – | – |
| PKU | √ | √ | – |
| WHU | √ | √ | √ |
| YNU | – | – | √ |

## LITERATURE REVIEW

In existing LIS studies, bibliometrics and citation indicators are regarded as the most important impact measures of scientific literature when assessing research performance (Davarpanah & Aslekia, 2008). Bibliometrics in the LIS field have been recognized as an independent research topic since 1958. And nowadays, it has been at the core of a number of science evaluation research groups around the world (Thelwall, 2008). Citations are treated as an index for the quality of LIS school faculties (Brace, 1992). Besides the citation indicator, as for literature content analysis, keyword analysis is a commonly used method world-wide. "Co-word analysis of both index terms and words extracted from titles, abstracts, and full text" is appraised as a keyword analysis shape for LIS research (Milojević, Sugimoto, Yan, & Ding, 2011).

Among all the different approaches of reporting research achievement, such as monographs, conference proceedings, etc., academic papers are the primary choice for researchers (Garvey, Lin, Nelson, & Tomita, 1972; Garvey, Lin, & Tomita, 1972). Statistical analysis in publications and their citations could directly tell the trends in one discipline. Shaw and Vaughan (2008) investigated the work and influence of a cross section of LIS researchers at various stages of their academic lives, using a random sample of faculty members at the programs accredited by the American Library Association through analyzing their publication numbers.

In the passing decades, LIS studies on the evaluation of research achievements or productivity of educational institutes, have explored many effective productivity and informative methods. As for LIS studies within mainland China, there have also been various approaches for different purposes.

It has been a hot spot for scholars to conduct their evaluation research of different institutes from various aspects. For example, Fang, Zhou, and Hu (2005) presented common research interests in the LIS field through a statistical analysis of the core authors in China. The analysis was conducted based on the distribution of core authors, their ages, their academic roles and the institutes they work for, the to-date research situation, the research trends and the development of the professional personnel in the field.

Besides analysis on research interests, comparative research of different institutes has also been a common research topic. Zhang (2004) developed a comparative study of thesis capabilities about publications in the LIS departments of Chinese colleges during 2000 and 2003, by comparing each school's publications in core journals and main topics of the papers. And based on the results, the author listed 5 highlights for LIS research fields. Then Zhang (2005) analyzed the published articles and projects, and compared the productivity of all LIS departments, which were conducting at least one project of the National Social Science Foundation of China. This analysis revealed the strong productivity of the five LIS academic institutes compared to others in terms of papers and national projects, and discussed the reasons.

Among all the analytical research, there is a type that involves Chinese keyword analysis. In such research, keywords are directly obtained, manually extracted from titles, or automatically extracted using simple keyword extraction tools (Fang et al., 2005; Ma & Zhang, 2006; Wei, 2006). When concentrated on qualitative analysis in depth, such as descriptive research on papers' subject distribution, abstracts or full text analysis, methods using statistical tools or visualization tools are

employed. Zhang and Ma (2007) selected 58 high frequency keywords in the knowledge management research field, and analyzed the research paradigm of knowledge management through co-keyword analysis. In this paper, the authors pointed out that the co-keyword analysis method should contain factor analysis, cluster analysis and multi-dimensional scale analysis. Also, method selection for one's research should depend on the research subject.

Considering China's academic appraisal system, the role of national projects cannot be neglected. The number of LIS projects approved by the "National Social Science Foundation of China" (SSFC) and the "National Natural Science Foundation of China" (NSFC) is another valid evaluation indicator, except for academic papers, for LIS institutes' productivity. Funds granted to educational institutes in mainland China are always rooted in specific projects. The SSFC and the NSFC are the two authoritative fund providers at the national level.

Yang and Zhu (2007) made a comprehensive and systematic comparison and analysis in terms of numbers, categories, applicants and topics of those research projects granted by the SSFC and the NSFC in the field of "Library, Information Science and Archives Management" during 2000 and 2006. The results showed that the number of funds granted to the higher education institutes took up 84.12% of all funds granted by SSFC. This means that higher education institutes have become the primal force in LIS research. In general, the trends of funds granted by SSFC and NSFC are consistent in the field of LIS. In their study, highlights of these two funds include development and exploitation of information assets, librarianship, construction of digital libraries, information construction, information services, future development of library science and informatics, electronic government, etc.

## METHODOLOGY

### *DATA SOURCE*

This paper analyzes LIS research status from 2008 to 2012, the data is collected in 2013 and refreshed in 2014. We conduct a literature analysis and a project analysis based on term frequency statistics. The combination of paper analysis and research project analysis could be more comprehensive and better reflect the trends and characteristics of research.

In this paper, academic paper analysis is carried out based on papers collected from two sources: those included by SSCI and those included by CSSCI. SSCI and CSSCI are the two primary databases for research papers in mainland China. SSCI (Social Science Citation Index) is an interdisciplinary citation index product, covering 2474 of the world's leading journals in social sciences across more than 50 disciplines. The SSCI database provides information about an article's citation frequency, authors, and publishers. CSSCI (Chinese Social Science Citation Index), founded by the cooperation of Nanjing University and HKUST (The Hong Kong University of Science & Technology), is also an interdisciplinary citation index product, covering more than 500 Chinese journals in social sciences across 25 disciplines. It is regarded as the most authoritative index for information reference and assessment of social science in China. In the "LIS" discipline, there exist 20 source journals and 5 extension source journals (see Appendix B), and its selection criteria is based on rankings of their impact factors. The extension source journals are alternative journals defined as "candidate journals" for CSSCI source journals. Some institutes take extension source journals as one of the evaluation criteria of their faculties' research achievements. Based on the SSCI and CSSCI databases, various paper analyses could be carried out, for example, annual distribution analysis, authors and institutes productivity analysis, keywords analysis, influence analysis, etc.

As for research projects in this study, we concentrate on those funded by the abovementioned SSFC and NSFC. Based on the data collected for the 10 institutes from the SSFC database and the NSFC database, we conduct a research project analysis from the views of their annual distribution and theme distribution.

### *DATA BIBLIOMETRICS*

The sampling range for this study covers papers published, as well as research projects approved by the 10 sample LIS institutes from 2008 to 2012. As for the statistics on academic papers, the data were collected from the CSSCI database and the SSCI database directly. After duplication removal, 5328 CSSCI papers and 91 SSCI papers are collected as valid papers for further analysis. For comparison, the total number of papers by all LIS institutes that are included by CSSCI is 22,873.

Two indexes are employed to evaluate the productivity and academic influence of LIS educational institutes: paper quantity and citation frequency. Generally, the two indexes both indicate one institute's academic strength and influence, which are also indispensable factors to reflect the productivity in research. However, during data collection, we found that some of the 10 sample institutes use inconsistent institute names in publications. Sometimes, different institute names actually correspond to the same one. In this study, we screened out all papers of this kind and categorize them under a unified institute name framework. For example, papers published by CSIR (The Center for the Studies of Information Resources of Wuhan University), School of Information Management of Wuhan University and its experiment center are all regarded as papers by the School of Information Management of Wuhan University.

### *KEYWORD ANALYSIS*

The keyword-based bibliometrics method is an important category of methods for citation frequency analysis, and is a good way to map research themes (Dehdarirad, Villarroya, & Barrios, 2014; Petrick, 2014). The extracted high-frequency keywords from the papers can be treated as research hotspots in certain disciplinary fields.

In this study, keywords from the CSSCI papers are directly obtained and processed through a co-citation map with the help of the automatic tools CiteSpaceII and AntConc, while keywords from the SSCI papers and research projects are selected manually through a retrieval statistic program and analyzed artificially. With the help of keyword frequency, we classified the related papers based on their themes, and analyzed these papers' focus in LIS research. Such analysis methods are commonly used in China's LIS field (Qiu & Hou, 2008; Qiu & Wen, 2011; Qiu, Wen, Zhou, Zhang, & Zhang, 2004; Zhang, 2005; Zheng, 2010).

It is noted that we also extracted keywords from titles of SSCI papers using WordParser and AntConc, in order to examine whether there were any omitted words. And for possibly synonymous keywords, the ones in the thesaurus or those most frequently used are chosen. For example, the keywords "web", "network" and "Internet" are synonyms. Since we found that the "Internet" is more frequently used than others in SSCI papers, we chose "Internet" as a representative for all the three keywords.

### *TOOLS AND PROCEDURES*

The analysis results are processed and presented using keyword extraction tools and visualization tools. For term frequency statistics and keyword analysis, we chose CiteSpaceII, WordParser and AntConc. With the help of these tools, data are quantized and visualized for further quantitative analysis.

CiteSpaceII is a distinctive and influential information visualization tool. In our paper, CSSCI papers published by the 10 sample institutes are firstly downloaded and imported to the software. Then, keywords are extracted and thresholds are set before we get the final citation map.

WordParser is a tool for Chinese character analysis. The main function of WordParser is word segmentation for text and term frequency statistics. After word segmentation, mistakes are rectified. Then, word segmentation results are imported into AntConc to calculate word frequency.

The AntConc is a free semantic corpus tool. "N-Grams" is a clustering tool embedded in AntConc, which can be used to calculate the frequency of each word in word groups. After Chinese character segmentation for the titles, data are imported to AntConc. By running the "N-Grams" in "Cluster" and setting maximum and minimum size values both to 2, we could get the frequency results, and the meaningless phrases are omitted.

## RESULTS

### *ACADEMIC PAPERS INCLUDED BY CSSCI*

#### *ANNUAL DISTRIBUTION*

For the five-year period analysis, Table 2 shows exact numbers of CSSCI-indexed papers and the percentage of papers by the 10 sample LIS institutes out of papers by all LIS educational institutes. In each year of the first four years, the numbers of indexed papers by the 10 sample LIS institutes are around 1100, while the number of papers by all institutes is over 4600. The total numbers steadily grew during 2008 and 2011, and in 2010, the number of papers by all institutes reached its peak at 4702. Based on the data presented in Fig. 1, the numbers steadily grew during 2008 and 2011. However, there was a minor drop in 2012, but the total numbers still remained above 4000. Each year, over 1/5 of all papers come from the 10 sample institutes, and the percentage reached almost 1/4 in 2008 and 2012.

### *PRODUCTIVITY OF INSTITUTES*

*PAPER NUMBER ANALYSIS.* Table 3 gives the rankings of the 10 sample institutes among all institutes based on their total publication numbers. It can be seen that 7 of the 10 samples are among the top 10 most productive institutes. 2 institutes rank 11th and 13th, while the "School of Public Management of Yunnan University" ranks lowest.

From the perspective of researcher productivity, we ranked the top 50 most productive authors based on their publication numbers, and Table 4 enumerates the productive authors that come from the 10 sample institutes. In this table, authors' publication numbers during 2008 and 2012 are listed, as well as their affiliations. Out of all 50 authors, 29 belong to 9 of the 10 sample LIS institutes, and all the 29 are professors. This list reflects the great advantages of the 10 sample LIS institutes in author productivity compared to other institutes. And it can also be inferred that the selected 10 sample institutes could reflect the entire research status of LIS in China.

*CITATION FREQUENCY ANALYSIS.* To provide further proof for the productivity and academic influence evaluation of the 10 sample institutes, we searched the "Chinese Journal Highly Cited Indicators" published by the Science and Technology Information Research Institute of China. This book covers more than 6000 Chinese and English periodicals formally published in China, and its data source is comprehensive and authoritative. According to its statistics, 7 sample institutes appear in the top 10 most highly cited institutes. Detailed total citation frequency and citation numbers are given in Table 5.

Furthermore, we ranked the authors from the 10 sample LIS institutes based on citation frequency, and Table 6 shows the citation numbers and citation ranking results of the authors from the 10 sample LIS institutes. The authors in this table are grouped based on their affiliations. It can be seen that 8 of the top 10 authors in the ranking are from the 10 sample LIS institutes. However, none of the 30 authors belongs to School of Management of JLU, of CCNU, or the School of Public Management of YNU. To some extent, this reveals that the 3 institutes lack influential authors.

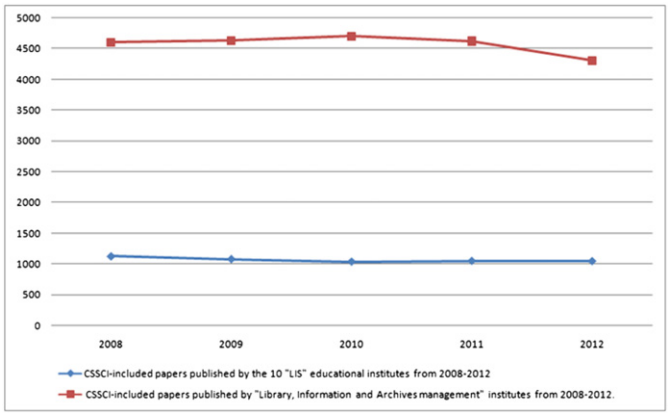


**Fig. 1.** Annual CSSCI-indexed paper number trend-lines from 2008 to 2012.

### *KEYWORD ANALYSIS*

A keyword co-citation map of the 5328 retrieved papers is generated by CiteSpaceII. In the co-citation map, the frequency of each extracted keyword is calculated, and the co-citation relationship between different keywords is also generated.

Table 7 lists the top 15 most frequent keywords. Among these keywords, "library" ranks first with a frequency of 380. It is followed by keywords related to techniques and the Internet, such as "ontology" and "Web2.0", both of which have frequencies over 100. Meanwhile, keywords related to bibliometrics also exhibit high frequency, such as "citation analysis", "CSSCI", and "journal evaluation". The burst value shown in Table 7 is proposed by Kleinberg (2002, P. 91–101) to identify highly cited references. Higher burst values could reflect a sharp rise in the citation frequency of the topic, as well as the emergence of certain research preferences. All the values listed are generated by CiteSpaceII. In our analysis, "information service", "journal evaluation", "information retrieval", "knowledge management" and "competitive intelligence" are the five keywords that have shown greater frequency growth in the research from 2008 to 2012.

As for the co-citation relationship presented by keyword clustering results, all the extracted keywords are grouped into two main clusters. One of them is related to "bibliometrics", while the other to "library management and service". The bibliometrics group includes the keywords "Journal Evaluation", "Citation Analysis", "CSSCI", and "Academic

**Table 2**
Annual distribution of CSSCI-indexed papers in the "LIS" field from 2008 to 2012.

| Years | The number of included papers by the 10 sample LIS institutes | Total included papers of LIS | Percentage |
|---|---|---|---|
| 2008 | 1124 | 4605 | 24.41% |
| 2009 | 1078 | 4635 | 23.26% |
| 2010 | 1035 | 4702 | 22.01% |
| 2011 | 1048 | 4624 | 22.66% |
| 2012 | 1043 | 4307 | 24.22% |

**Table 3**
Publication numbers of the 10 sample LIS institutes during 2008 and 2012, and their rankings among all affiliations of LIS publications during 2008 and 2012.

| Rank | LIS institute | Publication numbers |
|---|---|---|
| 1 | WHU | 1109 |
| 2 | CAS | 872 |
| 3 | NJU | 735 |
| 4 | PKU | 659 |
| 5 | NKU | 511 |
| 6 | JLU | 464 |
| 7 | SYSU | 440 |
| 11 | RUC | 254 |
| 13 | CCNU | 235 |
| 70 | YNU | 49 |

**Table 4**
List of authors from the 10 sample institutes that appear in the top 50 most productive authors based on publication numbers. The list is grouped by their affiliations.

| Author affiliation | Author | Publication numbers | Total ranking |
|---|---|---|---|
| WHU | Qiu J. | 94 | 1 |
| | Xiao X. | 51 | 5 |
| | Zhang Y. | 33 | 23 |
| | Huang R. | 31 | 28 |
| | Si L. | 30 | 34 |
| | Ma F. | 29 | 40 |
| | Li G. | 28 | 41 |
| | Hu C. | 27 | 42 |
| CAS | Sun T. | 45 | 7 |
| | Leng F. | 36 | 15 |
| | Zhang X. | 35 | 18 |
| | Fang S. | 30 | 34 |
| | Chu J. | 29 | 40 |
| | Zhu Z. | 29 | 40 |
| | Zhang Z. | 26 | 50 |
| NKU | Wang Z. | 93 | 2 |
| | Ke P. | 54 | 4 |
| | Han Z. | 32 | 25 |
| | Xu F. | 27 | 42 |
| NJU | Zheng J. | 38 | 12 |
| | Sun J. | 36 | 15 |
| | Zhu Q. | 34 | 21 |
| | Su X. | 27 | 42 |
| JLU | Bi Q. | 46 | 6 |
| | Wang P. | 37 | 13 |
| SYSU | Huang X. | 30 | 34 |
| | Tang G. | 26 | 50 |
| PKU | Liu Z. | 34 | 21 |
| CCYU | Xia L. | 26 | 50 |

**Table 6**
Authors from the 10 sample LIS institutes ranked by their citation frequency.

| Author affiliation | Author | Citation frequency | Total ranking |
|---|---|---|---|
| WHU | Qiu J. | 1194 | 1 |
| | Ma F. | 613 | 3 |
| | Hu C. | 423 | 12 |
| | Chen C. | 369 | 15 |
| | Xiao X. | 348 | 16 |
| | Huang Z. | 343 | 17 |
| | Peng F. | 131 | 41 |
| | Zhao R. | 124 | 44 |
| | Huang R. | 117 | 45 |
| | Xie Z. | 99 | 49 |
| PKU | Wu W. | 461 | 7 |
| | Li G. | 442 | 10 |
| | Wang Z. | 380 | 14 |
| | Liu Z. | 194 | 28 |
| | Lai M. | 181 | 31 |
| | Wang Y. | 165 | 34 |
| | Xiao L. | 141 | 39 |
| NJU | Su X. | 453 | 9 |
| | Ye J. | 288 | 21 |
| | Ye Y. | 176 | 32 |
| | Shen G. | 117 | 45 |
| NKU | Ke P. | 465 | 6 |
| | Wang Z. | 455 | 8 |
| | Yu L. | 426 | 11 |
| CAS | Chu J. | 309 | 19 |
| | Zhang X. | 301 | 20 |
| RUC | Feng H. | 221 | 23 |
| | Suo C. | 141 | 39 |
| SYSU | Cheng H. | 534 | 5 |
| | Huang X. | 152 | 36 |

Influence", while the other group includes "public library", "information service", and "library management".

*PAPERS INCLUDED BY SSCI*

*ANNUAL DISTRIBUTION*

In a five-year period from 2008 to 2012, the 10 sample LIS institutes had a total of 91 papers included by SSCI. Fig. 2 shows its annual statistics. The percentage was generally steady during 2008 and 2010. However, there was a sharp rise from 21.98% to 39.56% in 2012.

*INFLUENCE OF INSTITUTES*

The total citation of the 91 papers is 366, among which 54 papers have been cited for at least once. The average citation count is 2.04, with an H index of 7. This means 7 papers have citation counts greater than 7. Take the citation of the author named Ye Ying as an example: from 2008 to 2012, his paper citation counts are 2, 9, 26, 54 and 62, which exhibits a fairly rapid growth.

Table 8 shows the statistics on SSCI-indexed paper numbers and the citation frequency of the 10 sample institutes. Among the 10 samples, WHU, NJU and CAS exhibit relatively outstanding performance. WHU has the biggest publication number, and NJU has the highest citation frequency, while none of the SSCI-indexed papers is from NKU, YNU and CCNU. This could reflect the fact that WHU, NJU and CAS encourage more international cooperation, or their faculties participate in more international projects.

**Table 5**
The top 10 most-frequently-cited institutes in the "LIS" discipline in 2009.

| Rank | Institutes | Citation frequency | Cited-paper numbers |
|---|---|---|---|
| 1 | WHU | 1389 | 601 |
| 2 | PKU | 971 | 357 |
| 3 | CAS | 720 | 240 |
| 4 | NKU | 613 | 208 |
| 5 | SYSU | 598 | 242 |
| 6 | NJU | 516 | 224 |
| 7 | CCNU | 377 | 90 |
| 8 | Tsinghua University | 359 | 122 |
| 9 | National Library of China | 335 | 169 |
| 10 | Zhengzhou University | 329 | 175 |

*KEYWORDS ANALYSIS*

Table 9 shows the top 10 keywords out of all 528 in the 91 SSCI-indexed papers based on the appearance frequency. We applied a process combining rearranging, screening and abstracting to all keywords, and merged all synonyms. After the process, 375 words were generated as the final keywords. The word "internet", with 20 appearances, ranks top of the list.

Some traditional topics in the "LIS" field remained popular. "Information Retrieval" appeared 17 times, and "Information Resource" appeared 14 times. The word "China" also appeared frequently. Papers with the keyword "China" mainly introduce research progress and trends in certain aspects of the "LIS" development in China. These

**Table 7**
The top 15 most frequent keywords from papers included by CSSCI of the 10 sample LIS educational institutes.

| Ranking | Keyword | Frequency | Burst value |
|---|---|---|---|
| 1 | Library | 380 | – |
| 2 | Digital library | 277 | – |
| 3 | Public library | 250 | – |
| 4 | Citation analysis | 197 | – |
| 5 | Library science | 195 | – |
| 6 | Knowledge management | 193 | 6.69 |
| 7 | Information science | 188 | – |
| 8 | Competitive intelligence | 188 | 3.85 |
| 9 | CSSCI | 183 | – |
| 10 | Journal evaluation | 174 | 4.54 |
| 11 | Information service | 172 | 1.84 |
| 12 | Ontology | 170 | – |
| 13 | Information retrieval | 140 | 4.35 |
| 14 | Knowledge service | 110 | – |
| 15 | Web2.0 | 102 | – |

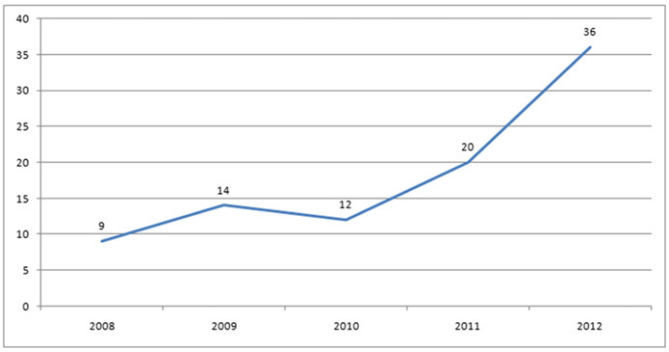


**Fig. 2.** Annual SSCI-indexed paper number trend-lines from 2008 to 2012.

works could help foreign researchers to get a better understanding of the situation, techniques and development in China's LIS research. However, based on the extracted keywords, comparative analysis on LIS research between China and other countries is inadequate.

Additionally, keywords about bibliometrics accounted for a large part, such as "hirsch-index", "citation analysis", and "bibliometric methods". Beside the keywords shown in Table 9, there are other keywords like "visualized analysis" and "network analysis", whose frequency is too low to be included.

### *NATIONAL PROJECTS*

#### *ANNUAL DISTRIBUTION*

Table 10 shows statistics on the numbers of projects approved by SSFC and NSFC during 2008 and 2012. Table 11 shows the project distribution in the 10 sample LIS institutes. Table 12 ranks the 10 sample institutes according to their founding date, and gives their faculty numbers. We believe that these two items may be related to their project numbers, productivity, as well as their influence. Note that project numbers in this paper are all counted based on the principal investigators.

It can be seen from Table 10 that there was significant growth in the SSFC and NSFC project numbers around 2010. However, project distribution among the 10 sample institutes is unbalanced (Table 11), and SSFC projects are usually much more than NSFC projects in all institutes expect CAS. Comparing the ratio of NSFC-project numbers to SSFC-project numbers, it could be noticed that there are different types of institutes. For example, WHU, RUC and CCNY have relatively balanced SSFC–NSFC ratios. However, PKU, SYSU and YNU did not get any support from NSFC for the "LIS" discipline. This means that these institutes are better developed in social science. On the contrary, CAS got far more NSFC projects compared to SSFC ones. Considering the different discipline arrangement shown in Table 1, the above results are understandable.

**Table 8**
Statistics on numbers and citation frequency of SSCI-indexed papers by the 10 sample institutes during 2008 and 2012.

| Institute | Publication numbers | Citation frequency |
|---|---|---|
| WHU | 47 | 139 |
| NJU | 26 | 163 |
| CAS | 18 | 112 |
| SYSU | 2 | 15 |
| PKU | 2 | 4 |
| RUC | 1 | 1 |
| JLU | 1 | 0 |
| NKU | 0 | 0 |
| YNU | 0 | 0 |
| CCNU | 0 | 0 |

**Table 9**
The top 10 most frequent keywords from papers included by SSCI of the 10 sample LIS educational institutes.

| Rank | Keyword | Frequency |
|---|---|---|
| 1 | Internet | 20 |
| 2 | Information retrieval | 17 |
| 3 | Hirsch-index | 15 |
| 4 | Citation analysis | 15 |
| 5 | Information resource | 14 |
| 6 | China | 13 |
| 7 | Bibliometric methods | 8 |
| 8 | Websites | 7 |
| 9 | Digital libraries | 6 |
| 10 | Model | 6 |

Based on Tables 10, 11 and 12, we could reach the following conclusions: 1) WHU, NJU and CAS are in a dominant position in terms of total project numbers. And the total numbers of SSFC and NSFC projects (Table 11) approved to these institutes account for over 50% of all national project numbers (Table 10). 2) For WHU and RUC, the numbers of projects approved by NSFC and SSFC are relatively balanced. 3) As for project numbers per capita, NKU, CCNU and WHU excel over other institutes. The average project numbers per capita of these 3 institutes are over 0.5. 4) Combining Tables 10 and 11, we can see that over half of the national projects are granted to the 10 sample institutes. This tells us that these 10 samples are more supported than other institutes.

#### *KEYWORDS ANALYSIS*

Table 13 shows the top 10 most frequently appearing phrases in all the national projects. "Information Resource" is the most frequent term with 27 appearances. The topic of information resource includes collection, exploration, utilization and evaluation of information resources. There are also several other phrases related to "information", such as "information service", "internet information", "information retrieval" and "information ecology". The phase "competitive intelligence" is meant digging and analysis of competitive intelligence in enterprise, which is also related to information.

The three keywords, "mode research" (14 times), "application research" (10 times), and "empirical research" (5 times) are related to research methodology. Mode research is a theory based on practice. In order to better guide practice, it summarizes a theoretical methodology for solving practical problems, which reveals objects' nature and laws. It includes "training mode", "activity mode", "service-creativity mode" and "develop mode". "Applied research" and "empirical study" are research methods that apply theory to practice and use empirical results to prove theory. We further ranked all keywords related to theoretical research, and the top three keywords of each year from 2008 to 2012 are listed in Table 14.

## DISCUSSION

### *RESEARCH GROUPS*

Based on the data provided by our survey, it can be concluded that the 10 sample LIS institutes have the leading research author groups

**Table 10**
Annual distribution of project numbers approved by SSFC and NSFC to the 10 sample LIS educational institutes.

| Year | SSFC project numbers | NSFC project numbers |
|---|---|---|
| 2008 | 18 | 7 |
| 2009 | 20 | 9 |
| 2010 | 30 | 11 |
| 2011 | 34 | 20 |
| 2012 | 32 | 16 |
| Total numbers | 134 | 63 |

**Table 11**
Distribution of project numbers approved by SSFC and NSFC to the 10 sample institutes during 2008 and 2012.

| LIS institute | Number of SSFC projects | Number of NSFC projects | Total numbers |
|---|---|---|---|
| WHU | 24 | 17 | 41 |
| NJU | 22 | 3 | 25 |
| PKU | 12 | 0 | 12 |
| CAS | 8 | 26 | 34 |
| RUC | 11 | 8 | 19 |
| SYSU | 18 | 0 | 18 |
| NKU | 8 | 1 | 9 |
| CCNU | 15 | 7 | 22 |
| YNU | 10 | 0 | 10 |
| JLU | 6 | 1 | 7 |
| Total numbers | 134 | 63 | 197 |

**Table 13**
The top 10 most frequent phrases that appeared in projects granted to the 10 sample LIS institutes.

| Rank | Phrases | Frequency |
|---|---|---|
| 1 | Information resources | 27 |
| 2 | Model study | 14 |
| 3 | Digital library | 12 |
| 4 | Applied research | 10 |
| 5 | Information service | 8 |
| 6 | Network information | 8 |
| 7 | Information retrieval | 5 |
| 8 | Information ecology | 5 |
| 9 | Empirical study | 5 |
| 10 | Competitive intelligence | 5 |

in China. Productive individuals are emerging in these institutes, and core authors of all top topics are professors from the 10 sample institutes (Table 3).

Though CSSCI includes 58 times as many papers as SSCI for the 10 samples, the growth in the number of SSCI-indexed papers reflects that the "LIS" educational institutes are attaching importance to their international views and are making efforts to join the world. The reasons for the significant difference in publication numbers between CSSCI and SSCI may be explained from the following aspects: a) cognition of SSCI journals. Publication in SSCI journals is not an indispensable precondition for achieving degrees or promoting academic titles. As far as we have investigated, none of the 10 programs request publication of SSCI-included papers for conferring PhD degrees. b) Language limitation. None of the SSCI journals in the "LIS" field accept papers in Chinese. And in colleges, English writing courses are always optional and "product approach" in English-writing teaching is playing a dominant role (Zhu, 2011). This gives potential researchers always a poor foundation of English-writing. c) Similar to SSCI, CSSCI has strict manuscript review procedures, and papers are also of high quality. More importantly, scholars or students could write directly in Chinese. Despite these reasons, some policies have already been made to encourage researchers to publish more SSCI-indexed papers. For example, in most universities, the assessment for the national scholarship awarded by the China's Ministry of Education, which is issued in 2012, takes SSCI publications as an important factor.

## *DISCIPLINES*

### *DISCIPLINES GAP*

As we have discussed, LIS in China includes Library Science, Information Science and Archives Management. The disciplines of Library Science and Information Science in our research are proven to be popular and productive, especially Information Science. However, research topics or authors related to Archives Management scarcely appeared in our top list. And in source journals and its extension of CSSCI database, there are only two directly related to Archives Management (see in Appendix B). This phenomenon reflects the unbalanced development in disciplines of LIS in China.

### *DISCIPLINE STAGE*

In the first four-year period research, the numbers of CSSCI-indexed papers of the 10 sample institutes have little annual variation (Fig. 1). This may reflect that it is in a relatively stable stage of the "LIS" development. The main factor leading to this is that CSSCI-indexed source journals and leading researchers did not change much in the five years. Influential experts' papers are usually of high citation frequency, and as a result, are usually preferred by source journals. The 10 sample institutes are proven to have taken most of the top experts in the field of LIS (Table 12). In a five-year period, main researchers of a topic are always stable both in their research territories and institutional affiliations. Especially for the 10 sample institutes' professors, we believe that professors' flow in the "LIS" is more likely mutual between any 2 of the 10 institutes. And these internal changes cannot affect the whole trend.

In 2012, the number of CSSCI-indexed papers is lower (Fig. 1). Comparatively, SSCI-indexed papers' number is in a sharp rise (Fig. 2). This may be caused by some policy effects. As far as we know, SSCI-indexed papers have been an important evaluation factor for promotion in the School of Library and Information Management of WHU. It illustrates the aggregation in the research ability of China's scholars in the "LIS" discipline, who are attempting to make communication with scholars abroad. As leaders are important in discipline development, it is a favorable phenomenon for the 10 sample LIS institutes in efforts to introducing Chinese research achievements to the world. This may drive institutes of LIS discipline in China that pay attention to related research worldwide and promote innovation.

**Table 12**
Statistics about the time-honored LIS institutes in China.[a]

| LIS school/Department | Founding date | Number of academic faculty[b] | Number of professors/Research fellows | Number of associate professors/Research associates |
|---|---|---|---|---|
| WHU | 1920 | 72 | 31 | 33 |
| NJU | 1927 | 51 | 26 | 17 |
| PKU | 1947 | 31 | 16 | 11 |
| CAS | 1950 | 73 | 26 | 47 |
| RUC | – | 44 | 17 | 22 |
| SYSU | 1980 | 37 | 8 | 15 |
| NKU | 1983 | 13 | 8 | 2 |
| CCNU | 1984 | 42 | 19 | 15 |
| YNU | 1984 | 22 | 10 | 9 |
| JLU | 2000 | 19 | 11 | 6 |
| Total numbers | – | 404 | 172 | 177 |

[a] We list 9 of the 10 LIS doctoral-degree-conferring institutes from history rank. Though "Archives Management" in RUC started in 1952, the Library science education and Information science education were developed respectively till 1998 and 2000.
[b] In this paper, we refer to the following academic faculty positions: professors, associate professors and lecturers. Administrative staff and adjunct professors are excluded.

**Table 14**
Statistics of keywords related to "theory" in SSFC projects during 2008 and 2012.

| Year | Keywords related to theories |
|---|---|
| 2008 | Life cycle; information ecology; knowledge sharing |
| 2009 | Core competitiveness; digital preservation; personalized service |
| 2010 | Information organization; discipline service; cooperation and sharing |
| 2011 | Government information resource; social service; information safety |
| 2012 | Information equity; open access; linked data |

*DISCIPLINES CHANGE*

With Information Management gaining its popularity in LIS studies, some interdisciplinary concepts have been imported into this area recently. For example, from project analysis, we found that "information ecology" (Table 13) has emerged as a new concept, which concentrates on the study of information science from ecological views and theories. From 2008 to 2012, in the 10 sample institutes, there are 47 CSSCI-indexed papers published and 9 projects funded by SSFC and NSFC under the theme of "information ecology".

Bibliometrics used to be widely regarded as an effective method in LIS studies. In China, bibliometrics has become a separate subject, which is believed to be playing an important role in the "LIS" field (Qiu & Lv, 2013). And in our research, we revealed its credibility through analysis in the section 'Keywords analysis' under the Results section.

*TOP INSTITUTES*

The 10 sample institutes have their own characteristics. However, by comprehensively considering discipline building (Tables 1 and 12), research projects (Table 11) and research faculties (Tables 5 and 12), WHU, NJU, PKU and CAS have exhibited great advantages over others.

They exhibit higher productivity mainly for the following reasons: a) a longer history brings about more academic accumulation. These four institutes have longer histories than others and are among the first batch of institutes that qualified to confer PhD degrees in the "LIS" field. Specially, the "LIS" education in China started in WHU during the 1920s. And before 2003, there were only three doctorate-conferring institutes in LIS, PKU, WHU and CAS (Wang, 2009). In 2003, NJU was qualified for conferring doctorates. b) More official support provide better environment. LIS institutes in WHU and NJU are among the four that are selected as national key institutes by China's Ministry of Education, ranking first and third respectively. Meanwhile, the National Science Library of CAS is the only LIS institute owned by CAS. All the four institutes are better supported than others, which leads to stronger faculties and more graduates. c) Sufficient research funding guarantees steady development. With support from over 50% national projects being funded in the "LIS" discipline, these four institutes have established their own characteristic research superiority, which in turn lays solid foundation for their further development. d) Richer human resources ensure better productivity. The academic faculty numbers of the four institutes are much larger than others. Based on our statistics given in Table 12, the academic faculties of WHU, NJU and CAS are at least twice the number of other institutes. This explains the high productivity since academic faculty numbers are an important factor of research capacity. Though the academic faculty numbers of PKU have no advantage, the numbers of professors and associate professors account for a very great proportion of all academic faculties.

*"NETWORK"*

By counting the frequency of keywords extracted from the papers and subjects of research projects in Tables 7, 9 and 13, we defined the keywords that appeared twice or more as the core keywords in LIS research. Through this method, we extracted six core keywords, which are "Digital Library", "Information Service", "Information Retrieval", "Competitive Intelligence", "Information Resource", and "Citation Analysis". And two thirds of the core keywords are related to network in Chinese. This phenomenon could be summarized in three aspects:

(1) Research contents are enriched. With the development and application of the Internet, new terms appear in an inexhaustible variety, such as "network environment", "network technology" and "network resource". This is more than simple discipline interaction, but an integration of different disciplines, and an extension in research.
(2) Technology is a crucial factor in the "LIS" study. The application of technology in library management and service has affected the "LIS" study. Most traditional subjects are replaced by subjects integrated with new technologies, such as "ontology", and certain traditional subjects are back to the stage in new technology perspectives, such as "information resources" which is a substitution of the traditional expression for "literature resources", although "information resources" is a concept with a larger scope.
(3) Study methods of library science interconnect with those of information science. When it was born, information science was defined as "an interdisciplinary science derived from and related to such fields as mathematics, logic, linguistics, psychology, communications, library science, management, and other similar fields" (Borko, 1968). Meanwhile, library science is a more traditional discipline, and it always places emphasis on research related to librarianship. However, empirical studies make the two disciplines interconnect, because library science has paid much more attention to techniques, and information science has enhanced some traditional study methods in library science. And this accelerates the interconnection of different study methods. For example, "citation methods" has been developed into "websites analysis method" in information science, and now "websites analysis method" is commonly used in library science study.

*TOP TOPICS*

The previously mentioned six core keywords are representative of China's LIS research in 2008–2012. We have studied and analyzed all the papers related to each keyword, and address their themes or research highlights in the following sections.

*"DIGITAL LIBRARY"*

It is believed that "research and practice in digital libraries has exploded worldwide in the 1990s" (Borgman, 1999). After the 62th IFLA conference in 1996, which is held in Beijing, scholars in the "LIS" field of China began to pay attention to digital libraries. Through more than twenty years of exploration, studies on digital libraries have gained an irreplaceable position in the library science research. Digital libraries are regarded as a new form of traditional libraries in the information age, and they are believed to indicate the development of library forms in the future (Zheng, 2010). At the national level, digital libraries are regarded as one of the most important infrastructures (Zheng, 2010). The main subjects of "digital library" research are mainly about its technical application, its service in applying resources, the evaluation of digital libraries and the intellectual property protection problem.

*"INFORMATION SERVICE"*

In the five-year period analysis, "information service" research mainly includes: information service and acquisition, information service mode, subject librarian, Information Commons and Information Literacy, and library service under Web2.0. Among all the subjects, two are especially popular in this period: comparative study for service quality evaluation of different information institutes, and new ways for providing information service in libraries. To some extent,

the two subjects reflect the reality of policies and service market requirement in modern China. Government reports pointed out that the quality of information service influences the social cognition. Meanwhile, public libraries in China treat information service as an important social function of themselves, and also as a way to enhance their status (Li, Yu, & Xu, 2008). More and more information service institutes are emerging in China, and fierce competition forces institutes to change their traditional developing model. On this theme, scholars put forward many effective measures, such as taking full advantage of resources and talents, introducing new management methods (Li, 2010), improving service consciousness (Dai & Sun, 2007), and building new positive service models (Hu, 2006; Zhang, 2006, 2008).

### *"INFORMATION RETRIEVAL"*

Information retrieval (IR) has always been an important branch in LIS studies. A five-year term study shows that keywords related to it are of high burst value (Table 7). This means that topics related to "information retrieval" will still be playing an important role in LIS studies in the future. Though information retrieval has been proposed for years, scholars are still making their efforts for new innovation in the "information retrieval" study. One reason is that "new" technologies in computer science are emerging rapidly and applications of these technologies in the library workflow can increase retrieval effectiveness. China's LIS scholars give great attention to topics like "cross-language IR", "visual IR", and "personalized IR". Due to the different language principles between English and Chinese, the Chinese word segmentation has always been the most difficult and important part in "cross-language IR" research; "Visual IR" emerged following information visualization. In information science, scholars have paid more attention to paving ways for users to search information with not only texts, but also pictures, sound and other media forms. "Personalized IR" is a concept merging information service and information retrieval. It pursues high retrieval accuracy by not only ameliorating search engines' inherent rules but also considering the preference of terminal users.

### *"COMPETITIVE INTELLIGENCE"*

In the beginning of 1990s, "Competitive Intelligence" was imported to China, and not long thereafter, this subject has been spread over in the "LIS" field in China. A multitude of information researchers have paid high attention to it, written lots of related papers, and developed related programs. Researchers have been conducting concept discussion and application research for several years. In our survey, research programs are mainly about competitive intelligence enterprise, concentrated on competitive intelligence mining, analysis, service and application; papers are mainly about competitive intelligence of its status, characteristics in development, behavior psychology, and evaluation index. This reflects that information science is propelling its study to communicate with sociology in depth.

### *"INFORMATION RESOURCE"*

Information resource has been treated as a basic research object in library and information science and a foundation for developing business in library and information institutes. In the five-year period, "resource sharing" remains a perennial concern. All behaviors related to information resource, such as information collection, information organization, usage of information and information guarantee policies are research hotspots. Our survey shows that government information resource and enterprise information resource are the two research focus points. Main topics in government information resource research are the public access of government information resource and its value-added exploitation. Main topics in enterprise information resource research include service delivery and safety protection.

### *"CITATION ANALYSIS"*

Citation analysis is the examination of the frequency, patterns, and graphs of citations in articles and books (Garfield, Malin, & Small, 1983). Citations in scholarly works are used to establish links to other works or other researchers (Leydesdorff & Amsterdamska, 1990). Despite lots of research findings on the importance of the "citation analysis" method abroad, through our data analysis, "citation analysis" is also a popular method in the "LIS" field in China. As we have investigated, the keyword "citation analysis" has taken a certain proportion in papers included by CSSCI and SSCI, and terms, such as "journal evaluation", "network analysis", which are related to literature bibliometrics also account for a certain proportion.

## *ISSUES AND SOLUTIONS*

Through analysis of keywords in both CSSCI and SSCI papers and national projects in recent years, research contents conducted by qualified LIS educational institutes in mainland China are in depth and breadth with various forms and covering a broad range. Though the quantity of published papers and research projects are stable annually, the development of different educational institutes is unbalanced in the research productivity. Traditional topics in the "LIS" territory, such as information resource and information service, gain continuous attention, while new ideas and methods for further active exploration are introduced, complying with the pace of modern society. The modernization of LIS is inevitable, and it requires the traditional discipline to interact with other disciplines. Through analysis, there are three striking problems discussed in the following sections.

### *DEFICIENT COLLABORATION AMONG TEAMS*

China's LIS educational institutes lack strong and tight interconnections. In our research, cooperation between research teams for one subject is seldom seen. Instead of sequential research on one theme, there is much more short-term research, and similar research conducted by different teams. Therefore, cooperation among China's LIS institutes is needed, and joint efforts will greatly benefit the development of this discipline. Cooperation can make different researchers exert their own advantages. Individual researchers should be supported and encouraged to attend domestic and foreign academic forums and conferences, which could significantly increase cooperation.

### *OVERWHELMING CONCENTRATION ON THEORIES*

According to the analysis of the top topics in the section 'Top topics' under the Discussion section, the phenomenon that theories are more emphasized than techniques in LIS research still exists in China. It seems that most of the research hot spots are related to "Information Science" (Table 13). As the number of NSFC projects grows, more efforts seem to have been put on research in technologies and applications. However, theory research is still popular and has been treated as a distinctive feature in China's LIS study (Liu, 2008). Researchers in the "LIS" field have made their efforts in theory innovation to build new theories adapting to the times, emphasizing on the combination between theory construction and practical application and empirical methods gaining much more attention and becoming widely promoted (Table 14).

Hence, how to integrate advanced techniques with LIS research and how to keep up with modern technology become serious issues faced by those LIS educational institutes in China. Here we suggest that LIS educational institutes renew their curriculums and guide students and researchers to pay more attention to techniques.

### *LACK OF COMMUNICATION*

LIS research in China is now bound to its field, and lacks a broad connection and integration with other disciplines. This should be attributed not to LIS institutes, but to the unstable educational environment in our discipline. Though library science has been recognized as an independent discipline in 1921, it was canceled for six years (1966–1972)

during the "Chinese Cultural Revolution" in China. The interruption in the history of the Library Science caused severe damage to its development.

The modernization of LIS is inevitable, and it requires the traditional discipline to interact with other disciplines. Interdisciplinary research is a good way to expand researchers' horizons and the interdisciplinary research is not limited to computer science. Our previous research (Xiao & Li, 2012) found that SCI/SSCI papers published by iSchool members covered 54 different disciplines, such as in history, politics, even chemistry and medical science. And in another research, we (Xiao & Yang, 2012) found that over 70% of iSchool teachers have an interdisciplinary background. In order to enhance its productivity and influence and keep up with the latest development of LIS, LIS in China should also attach great importance to interdisciplinary interactions.

## CONCLUSION

In this study, our primary goal was to conduct a quantitative evaluation on the achievement, research productivity, and research hot spots in the "LIS" field in China. In our analysis of research articles in core journals, and research projects engaged by the representative LIS institutes of China, we showed that the sample institutes could be considered as the most productive educational institutes. However, from our analysis, it can also be seen that there still exist many issues regarding the development of LIS in China. Possible solutions to these issues are discussed in the hope of promoting the development of LIS in China and improving its productivity and influence.

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## APPENDIX A. HIERARCHY OF SUBJECTS RELATED TO MANAGEMENT AND THEIR CODE DEFINED BY THE MINISTRY OF EDUCATION OF CHINA

| Code | Subject |
|---|---|
| 12 | Management Science |
| 1201 | Management Science and Engineering |
| 1202 | Business Administration |
| 120201 | Accountancy |
| 120202 | Business Management |
| 120203 | Tourism Management |
| 120204 | Technology Economy and Management |
| 1203 | Agricultural and Forestry Economy Management |
| 120301 | Agricultural Economy Management |
| 120302 | Forestry Economy Management |
| 1204 | Public Administration |
| 120401 | Administrative Management |
| 120402 | Social Medicine and Health Service Management |
| 120403 | Educational Economy and Management |
| 120404 | Social Security |
| 120405 | Land Resources Management |
| 1205 | Library, Information and Archives Management |
| 120501 | Library Management |
| 120502 | Information Management |
| 120503 | Archive Management |

The subject with a two-digit code corresponds to a discipline classification. The subjects with four-digit codes and six-digit codes correspond to first-level disciplines and second-level disciplines, respectively.

## APPENDIX B. LIST OF CHINA'S SOURCE JOURNALS AND EXTENSION SOURCE JOURNALS IN "LIBRARY, INFORMATION AND LITERATURE SCIENCE" (2009–2013)

| Number | Journal | Organizing institute |
|---|---|---|
| *Source journals* | | |
| 1 | Journal of Academic Libraries | Steering Committee for Academic Libraries of China |
| 2 | Archives Science Bulletin | Renmin University of China |
| 3 | Archives Science Study | The Society of Chinese Archives |
| 4 | Journal of the National Library of China | National Library of China |
| 5 | Information Science | Chinese Information Society of Social Sciences, Jilin University |
| 6 | Information Studies: Theory& Application | Defense Technology Information Society of China |
| 7 | Journal of the China Society for Scientific and Technical Information | Institute of Scientific and Technical Information of China |
| 8 | Journal of Intelligence | Institute of Scientific and Technical Information of Shanxi |
| 9 | Information and Documentation Services | Renmin University of China |
| 10 | Library | Hunan Library |
| 11 | Library Work and Study | Tianjin Library, Library Society of Tianjin etc. |
| 12 | Library Development | Library Society of Hei Longjiang, Hei Longjiang Library |
| 13 | Library Tribune | Sun Yat-Sen Library of Guangdong Province |
| 14 | Library Theory and Practice | Ningxia Library |
| 15 | Library Journal | Library Society of Shanghai, Shanghai Library |
| 16 | Library and Information Service | National Science Library, Chinese Academy of Sciences |
| 17 | Document, Information& Knowledge | School of Information Management of Wuhan University |
| 18 | Library& Information | Gansu Library |
| 19 | New Technology of Library and Information Service | National Science Library, Chinese Academy of Sciences |
| 20 | Journal of Library Science in China | National Library of China, Library Society of China |
| *Extension source journals* | | |
| 1 | Library Work in Colleges and Universities | Steering Committee for Academic Library and information work of Hunan Province |
| 2 | Journal of the Library Science Society of Sichuan | Sichuan Society for Library Science |
| 3 | Research on Library Science | Jilin Province Library |
| 4 | Journal of Modern Information | National Science Library, Chinese Academy of Sciences<br>Institute of Scientific and Technical Information of Jilin |
| 5 | New Century Library | Library Society of Jiangsu Province |

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