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## Digital Scholarship Skills and Librarian Training Toward Digital Scholarship Services——Case Studies of Academic Libraries in China

### Tu Zhifang

National Science Library, Chinese Academy of Sciences, Beijing, China.

E-mail address: [tuzhifangwhu@163.com](mailto:tuzhifangwhu@163.com)

### Xu Huifang

National Science Library, Chinese Academy of Sciences, Beijing, China.

E-mail address: [xuhf@mail.las.ac.cn](mailto:xuhf@mail.las.ac.cn)



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### Abstract:

*Digital Scholarship is becoming a new focus of research community and libraries, which can be interpreted from different perspectives: a new kind of digital technology and digital products as well as a new kind of scholarly communication model, a new teaching and learning style and scientific research paradigm, these constitute a complete digital scholarship ecosystem in the digital, networked and new media era. Academic library is incubator of digital scholarship and in turn the new engine of academic library. Digital scholarship is the reasonable expanding of libraries' new business and librarians' core competitiveness, and it empowers libraries' innovation and transformation.*

*During August 2017, we investigated 15 academic libraries' digital scholarship services overseas and found that: Digital scholarship services programs were called as Digital Scholarship Commons/LAB, Center for Digital Scholarship and so on, which mainly include 7 types of issues: Physical Space, Tools, Research Data Services, Scholarly Communication and Digital Publishing, Digital Humanities, Digital Scholarship Seminars and Trainings, Digital Technology Support Services. Accordingly, librarians play roles of data analysis librarian, metadata librarian, online publishing designer, app engineer, it requires librarians to have diverse disciplinary backgrounds as well as a variety of digital skills above.*

*In China, digital scholarship services is promising but still emerging, digital scholarship skills training for librarians is necessary and significant. As the top-level academic libraries in China, Peking University Library, Tsinghua University Library, National Science Library attach great importance to cultivating qualified digital scholarship services librarians in plentiful ways, such as training, recruiting, setting up groups for online discussing and brainstorming. Just in Recently two years, they recruited three graduates from high-level universities as digital services librarian, they*

*provided several training programs centered with data librarian, research data management, they held three Digital Humanities forums, they set up Data Librarian Group and Digital Humanities Groups for scholarly communication and information sharing. The trainings, forums, and groups were popular and attracted librarians' active participation.*

*Digital scholarship services require librarians to master diverse skills, taking three academic Libraries in China as examples, this paper discusses the effective and feasible ways of cultivating skilled digital scholarship services librarians by recruitment, trainings, seminars and social network in China.*

**Keywords:** Digital Scholarship, Research Data Services, Data Librarian, National Science Library of CAS, Scholarly Communication.

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## **Background**

To better seize the opportunities and deal with the challenges from digital scholarship, our libraries and librarians have to take corresponding actions and provide adapted services to satisfy our users' need better. Naturally, librarians are expected to be qualified with digital scholarship services, that's to say, librarians have to master digital scholarship skills. So, we have to understand what digital scholarship refers to exactly and what issues it encompasses.

### **What is Digital Scholarship Exactly Refers to?**

The concept of digital scholarship has originals in the late 1990s in the UK. Originally referred to as e-science, the idea of applying new technology and data analysis tools to scholarship cycled through other names like cyberinfrastructure and e-scholarship before landing on the current umbrella term (Adams et al., 2017). The concept of digital scholarship gradually becomes less vague and more richful, thus different research communities, scholars and librarians have their own understandings of digital scholarship.

From the perspective of teaching and learning, digital scholarship is the research and teaching that is made possible by digital technologies, or that takes advantage of them to ask and answer questions in new ways (Melanie, 2013). From the life cycle of research, digital scholarship is the use of digital evidence and method, digital authoring, digital publishing, digital curation and preservation, and digital use and reuse of scholarship (Abby, 2013). From the scholarly communication model, digital scholarship encompasses the use of digital medias in scholarly communication and research, and attempts to take digital and social media as the credible, professional and legal way of research and communication (Adeline, 2012). From the perspective of digital technology, digital scholarship can be defined as any scholarly activity that makes extensive use of one or more of the new possibilities for teaching and research opened up by the unique affordances of digital media. These include, but are not limited to, new forms of collaboration, new forms of publication, and new methods for visualizing and analyzing data (University of Washington, 2015). From the perspective of digital product, Digital scholarship is often composed of works that are born digital, multimedia, database technology-based, analysis of other born digital material, digital text and images, digital music or art, and data sets (University of Washington Libraries, 2015).

Accordingly, digital scholarship is a concept of digital technology and academic product, as well as a kind of scholarly communication model, a new teaching and learning style and

scientific research paradigm, which constitute a complete digital scholarship ecosystem in this digital, networked and new media era(Figure1).

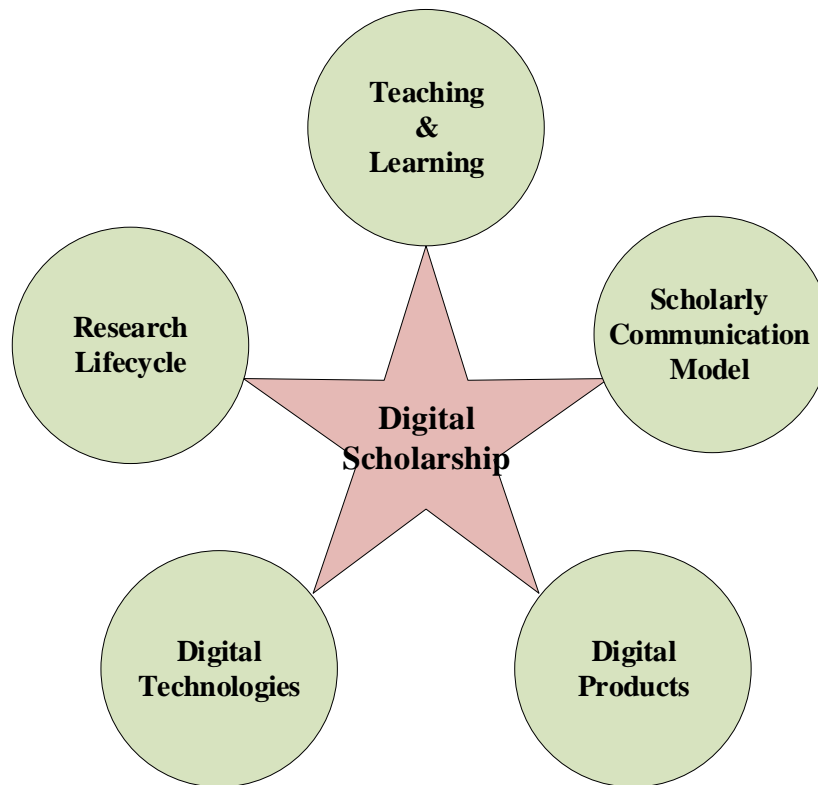


Figure 1 Perspectives of interpreting Digital Scholarship

Academic library is incubator of digital scholarship (Bryan, 2014), for it can provide necessary talents, space, facilities for digital scholarship’s promotion, discussion and practical activities, especially in the fields of data service, visualization and digital publishing (Bryan, 2014). In turn, digital scholarship is the new engine of academic library(Figure2). The application of digital technology, the construction of new scholarly communication model, the transformation of teaching and learning style and research paradigm, the enrichment of digital academic products, all these drive the contents and ways of library services to be advancing with the times, all these reshape the new states of library spaces, resources and services. Digital scholarship is the reasonable expanding of libraries’ new business and librarians’ core competitiveness (Angela, 2015), and it empowers libraries’ innovation and transformation.

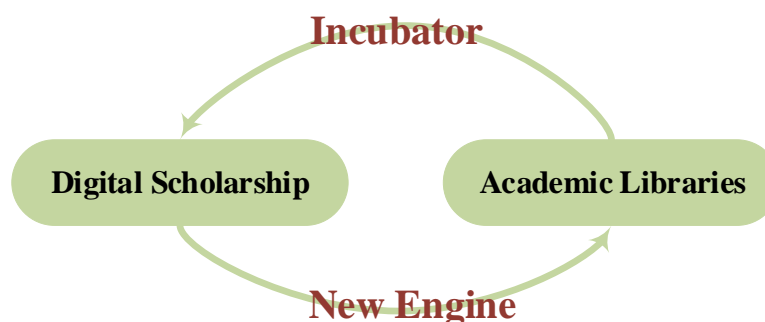


Figure 2 The interactive relationship of digital scholarship and academic library

## 1 Investigations of 15 Academic Libraries’ Digital Scholarship Services

Digital scholarship in overseas academic libraries is gradually becoming popular, and it is promising but still emerging in China, especially in the mainland. Therefore, following the clues of current researches and reports (Bryan, 2014; Jie and Sheng, 2016), we investigated 15 academic libraries' digital scholarship services in Hong Kong, the United States and Canada during August 2017 by visiting their websites.

## 1.1 Forms and Contents of Digital Scholarship Services

### *Interpreting and Delivering Digital Scholarship to the Public*

“Digital scholarship” behaviors in fact have existed in scholarship for a long time, but the concept of “digital scholarship” has only gradually become less vague and goes into the public sight in recent years. Digital scholarship is still in continuously dynamic developing states, thusly libraries usually deliver their understandings of digital scholarship to the users in order to enhance users' understanding, acceptance and utilization of digital scholarship services.

For examples, Chinese University of Hong Kong Library intends to support the use and reuse of digital evidence, digital tools, methods, and processes to help faculty, researchers and postgraduate students to accomplish their scholarly research. The Library provides services, online platform, cutting-edge space, tools, training, consultation and advice to support and promote digital scholarship research at the University through the entire research life cycle. University libraries of Washington insisted that digital scholarship is often composed of works that are never intend to be formally published. This new form of scholarly data, presentations and dissemination represents a shift away from publishing and the kind of scholarship that we have traditionally collected and preserved in libraries, and is a natural evolution and adaptation of digital technology to scholarship. The goals of digital scholarship in UW libraries are to raise awareness of digital scholarship happening at the UW, and to connect UW faculty, staff, and students with the assistance needed at any point during a digital scholarship project.

### *Forms and Programs of Digital Scholarship Services*

According to our investigation, different libraries' digital scholarship services have different forms and issues (Table 1), which not only can reflect the individual elements of physical space, digital resources, digital services, digital humanities, but also are the integrated collection of them.

Table 1 15 Academic Libraries' Digital Scholarship Services Programs

Digital Scholarship Services Program	Typical Libraries List
Digital Scholarship	University of Washington Libraries
Digital Scholarship services	University of Oregon Libraries
	New York University Libraries
	Lafayette College Library
Digital Scholarship Research services	Chinese University of Hong Kong Library
Digital Scholarship Commons	UC Santa Cruz University Library
Digital Scholarship LAB	University of Richmond Library
Center for Digital Scholarship	Brown University Library

	McMaster University Library
	Case Western Reserve University Kelvin Smith Library
	Emory University Library
	University of Notre Dame Library
Center for Digital Research and Scholarship	Columbia University Libraries
Scholarly Commons	Library of Illinois
Collaborative University Research & Visualization Environment	Georgia State University Library

***Contents and Issues of Digital Scholarship Services***

By sorting and summarizing, we found that digital scholarship services of academic libraries mainly include 7 types of issues (Figure 3):

- Physical Space
- Research Tools
- Research Data Services
- Scholarly Communication and Digital Publishing
- Digital Humanities
- Digital Scholarship Seminars and Trainings
- Digital Technology Support Services

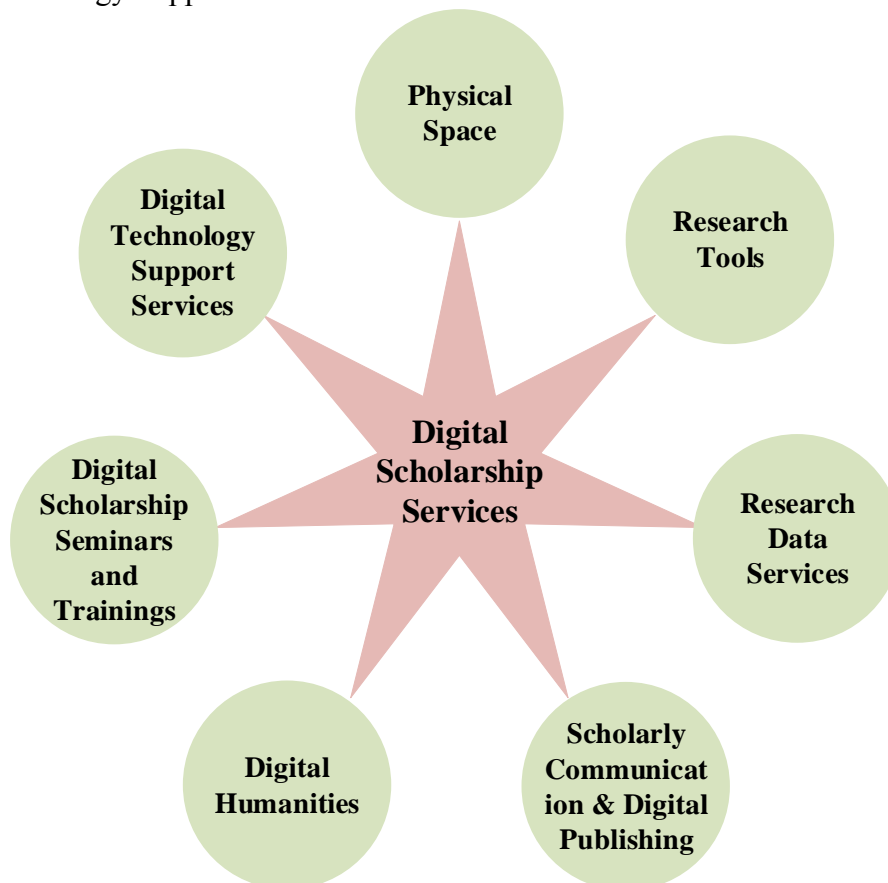


Figure3 Digital Scholarship Services Issues

Digital scholarship services of academic libraries are rich in tools, methods and communities. In addition to the above, services about audio, video, pictures, community education, online

exhibitions are welcomed as well.

## 1.2 Librarian Roles and Requirements of Digital Scholarship Services

When providing digital scholarship services, librarians play diversified roles and assume diversified responsibilities. Overall, the roles of librarians are determined on their education backgrounds, professional interests and responsible business. Librarians' titles are quite diverse, such as scholarly communication librarian, data analysis librarian, digital service librarian, physics and mathematics librarian, metadata/cataloging librarian, online publishing designer, engineering, etc.

Considering the library business and team members' descriptions, digital scholarship services not only require librarians to possess professional knowledge and skills, but also multidisciplinary backgrounds and a variety of digital skills. Just like the descriptions of Sherman Centre for digital scholarship of McMaster University Library, "administrative director: while firmly ensconced in IT management, his background is in German literature"; "digital scholarship librarian: his talents lie in complex and innovative systems administration and project management, he also has an interest in the maker/hacker element in digital scholarship and is frequently spotted tinkering with esoteric hardware".

Anyway, the context of digital scholarship requests that librarians have to renew knowledge and learn new skills continuously so that to adapt the changing world and meet users' needs. The capabilities of providing digital scholarship services are reasonable expanding of librarian's core competitiveness.

## 2 Digital Skills Training and Promoting for Librarians Toward Digital Scholarship——Case studies of Three Academic Libraries in China

As the top-level academic libraries in China, Peking University Library (PKU Library), Tsinghua University Library (THU Library), National Science Library of Chinese Academy of Science (Library of CAS) attach great importance to cultivating qualified digital scholarship services librarians in plentiful ways, such as recruiting, training, setting up groups for online discussing and brainstorming.

### 2.1 Librarian Training

#### Research Data Services Trainings

In recent two years, library of CAS conducted nearly ten training programs on library and information services, and nearly half of them specifically centered with data librarian, research data management, long-term preservation, etc. The programs were jointly organized by Library of CAS and the Branch of Special Libraries, Library Society of China, and they were popular and attracted librarians' active participation.

Table 2 Training Programs for librarians toward Digital Scholarship in library of CAS

Training Programs	Topics and Descriptions
Research Data Management and	<ul style="list-style-type: none"><li>• data science</li><li>• research data service management and services</li></ul>

Services	<ul style="list-style-type: none"> <li>• implementation of data management</li> <li>• data analysis and tools</li> <li>• research data release and dissemination</li> </ul>
Research Data Management in Practices	<ul style="list-style-type: none"> <li>• Introduction to research data and research data management</li> <li>• DMP (Data management plan) and other agreements during research processes</li> <li>• Research data and copyright</li> <li>• Hands-on licenses</li> <li>• Text and data mining</li> <li>• Repository</li> </ul>
Data Librarian Training	<ul style="list-style-type: none"> <li>• Big data: Trends and policies</li> <li>• Data Sharing: Best Practices</li> <li>• Data Copyrights: Laws and regulations</li> <li>• Data Copyrights: Contracts and Licenses</li> <li>• Data Use: data visualization</li> <li>• Data Normalization: Data Set Generation</li> <li>• Data Analysis: Supervised machine learning</li> <li>• Data Analysis: Unsupervised machine learning</li> </ul>
Data Visualization Methods and Tools Application	<ul style="list-style-type: none"> <li>• Data source and processing</li> <li>• Time-varying data visualization</li> <li>• Complex high-dimensional data visualization</li> <li>• Geospatial data visualization</li> <li>• Web data visualization</li> <li>• Text visualization</li> </ul>
Long-term Preservation of Digital Resources	<ul style="list-style-type: none"> <li>• Main technologies and standards for long-term preservation of digital resources (OAIS、PREMIS、ISO-16363)</li> <li>• National long-term preservation system for S&amp;T digital resources</li> <li>• Practical Exploration of Long-term Preservation of Digital Information</li> <li>• Mechanisms for participating in national long-term preservation system</li> </ul>

The Research Data Management and Services training program was aimed to help librarians to systematically learn the issues of research data management and services, including strategic planning, project implementation, data repository, legal issues, user promotion and so on. The training was hosted during 12<sup>th</sup> to 16<sup>th</sup>, June 2017, and professor Qin Jian from Syracuse University was responsible for all the course lectures (in Chinese). Besides, the program requested the librarians do group discussions, exercises and presentations to improve the training effectiveness and practical skills.

The Research Data Management in Practices training program was jointly organized by National Science and Technology Library (NSTL), library of CAS and German National Library of Science and Technology (TIB) during 18<sup>th</sup> to 20<sup>th</sup>, September 2017. Three director librarians from TIB undertook all the teaching tasks (in English). They mainly introduced the practices of TIB's development strategy based on product line, including scalable architecture and its research data platform, digital Object identifier (DOI), practices of DataCite and so on. All the practices of TIB may be inspirable to libraries and librarians of China.

The Data Librarian Training program 2018 was directly based on Data Librarian Training

program 2017 and 10 data librarian salons in 2017, and taking the release of National Standard “Scientific Data Citation” (GB/T 35294-2017) and National policy “Scientific Data Management” as the background and chance. Focusing on six issues of data rights, data sharing, security protection, data acquisition, data analysis, and data application, this training program was aimed to provide a platform for data librarians to improve their practical skills and exchange their experience.

The Data Visualization Methods and Tools Application training program’s goal is help librarians master several commonly used data visualization tools when they have relatively systematic understanding of visualization methods and mechanisms. We have consensus that visualization is significant in research and practical services, especially in this big data era.

The Long-term Preservation of Digital Resources training program is the product of Long-term Preservation of Digital Resources Project supported by Ministry of Science and Technology of China. In this digital age, long-term preservation is not only to facilitate the access to knowledge for contemporary people, but also an important measure to benefit future generations and preserve cultural heritage. Although the theory and practice of long-term preservation of digital resources are still not mature, librarians should have strong awareness and basic knowledge and skills of long-term preservation, that’s where the significance of the training lies in.

What’s more, though the significance of these trainings is difficult to quantify in the short term, it can be perceived meaningful and promising and will probably make far-reaching value for the development of librarians and librarianship of China. However, the training programs are not free, librarians who want to register the course have to pay hundreds to thousands yuan as the training fees. Therefore, it’s worth looking for discounted and even free trainings for librarians, especially librarians from the central and western China.

## 2.2 Seminars and Forums

### Digital Humanities Forums

Table3 Digital Humanities Forums held by PKU Library

Year	Forum Theme	Main Topics
2016	Crossing Boundaries and Engaging Communities : Digital Humanities under Global View	<ul style="list-style-type: none"> <li>• Digital Humanity Concept and Practice</li> <li>• Linguistics and text processing, knowledge exploration</li> <li>• The deepening of historiography and large-scale historical data</li> <li>• Art and data visualization</li> </ul>
2017	Interaction and Coexistence: Digital Humanities and Historical Research	<ul style="list-style-type: none"> <li>• Digital Humanities and Historical Geography</li> <li>• Digital Humanities and History Studies</li> <li>• Digital Humanities and Historical Documents</li> <li>• Digital Humanistic Infrastructure Construction</li> </ul>



2018	Incubation and Demand Driven Humanities Project Practice: Digital	<ul style="list-style-type: none"> <li>• Digital methods and tools for humanities teaching and research</li> <li>• Practice and Reflection on Global Digital Humanities Project</li> <li>• Digital humanities tools and infrastructure construction</li> <li>• Digital collation and revealing of humanities literature</li> </ul>
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The Digital Humanities Forum held by Peking University Library is an international seminar that attracted hundreds of researchers and librarians from all over the world. After three years' research and practice, we can find that more researchers from more fields are willing to actively participate in Digital Humanities, and their awareness of cross-discipline integration has been fully reflected in the practice of Digital Humanities Projects. The importance of human-computer collaboration in the construction of data-driven resources have begun to receive attention, and the Digital Humanities products which applying new technologies and methods are becoming fruitful.

### 2.3 Librarian Recruitment

Librarians' retirement and recruiting graduates from college as librarians are annually regular activities in libraries in China. Recruiting graduates is a significant way of talent team building and updating for many organizations, the library of CAS and PKU Library are no exception.

In fact, libraries usually arrange for the new employed librarians to undertake the jobs which request more related backgrounds and higher complicated skills, so very likely that the librarian candidates would equipped with digital scholarship skills from the start. Following take PKU Library and Library of CAS as the examples.

Just in recent two years, library of CAS and PKU Library released their recruitment notices and recruited three digital scholarship or data services librarians. The jobs' responsibilities and requirements are displayed in the table 4 below.

Table 4 Librarian Recruitment of PKU Library and Library of CAS

Year	Job Title	Job Responsibilities	Main Requirements
2017	Collection Research and Development Librarian (1 person) @ PKU Library	<ul style="list-style-type: none"> <li>• Collect and organize scientific research data, conduct data navigation and related data services;</li> <li>• Conduct analysis and research using data and analytical tools;</li> <li>• Maintain the data platform and conduct data monitoring services;</li> <li>• Conduct data literacy-related training or course services;</li> <li>• Participate in related</li> </ul>	<ul style="list-style-type: none"> <li>• Professional background of science and engineering;</li> <li>• Familiar with SPSS, Citespace, GIS and other data analysis and processing tools, visualization software, etc.;</li> <li>• Good communication skills, able to engage in training, consulting and other work.</li> </ul>

		work such as subject librarians, research support and patents	
2018	Digital Scholarship Services Librarian (2 people) @ Library of CAS	<ul style="list-style-type: none"> <li>• Participate in library collection research and collection digitalization plan and implement;</li> <li>• Participate in Key Digital Collection resources promotion and utilization;</li> <li>• Responsible for data resources integration, organization, disclosure, promotion and utilization;</li> <li>• Responsible for data analysis and visualization tools and resources integration and user training;</li> <li>• Participate in data analysis and visualization services exploration and promotion;</li> </ul>	<ul style="list-style-type: none"> <li>• With science and technology information and management or LIS education background;</li> <li>• Be proficient in computer and network technology related work;</li> <li>• Candidate who familiar with data analysis and visualization tools or have data analysis experience is preferred;</li> <li>• Good abilities of Self-learning, logical thinking, information seeking and analyzing.</li> </ul>

Generally, we can consider that recruitment is an effective method to “training” qualified digital scholarship services librarians with proficient knowledge and skills from the very beginning.

## 2.4 Scholarly Communication

In order to provide an open and instant platform for scholarly communication and discussion about data librarians, data services and Digital scholarship, Libraries in China prefer to set up WeChat Groups for researchers and librarians.

For Examples, PKU Library set up two WeChat Groups for the Digital Humanities Forum and named DH Group 1 and DH Group 2, library of CAS set up a WeChat Group named China Data Librarian Group (CDLG) for its Data Librarian Training. WeChat is a very popular instant messaging and social network App in China, like Facebook and Instagram in America. It has over 1 billion daily active users, and to a large extent it changed the communication behaviors of researchers and librarians as well, especially the timeliness and convenience of information sharing. Since the setting of CDLG and DH Groups, they have almost 1500 WeChat members (the limitation is 500 each), librarians and researchers in the groups share academic information and discuss user services issues very frequently and actively.

## 3 Discussion

Digital Scholarship has become popular in many European and American academic libraries, while it is still new issue in China. The concept of digital scholarship are gradually accepted and digital scholarship services are provided by part of academic libraries. Therefore, trainings and seminars are necessary for librarians.

In fact, the trainings and scholarly communication groups are not originally and specifically designed for digital scholarship. Especially, the trainings are centered with practical needs of library and information services and appear to be somewhat inadequate and unsystematic in the exact context of digital scholarship.

Looking to the future, top-level academic libraries like PKU library, THU Library and Library of CAS are expected to make top-level design and strategic planning better for digital scholarship. Other academic libraries in China can learn the experience of digital scholarship services, and do innovative and transformative services for users to realize better development.

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