

# Methods for Enhancing Digital Scholarship Services in University Libraries

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**Abstract.** Digital scholarship services (DSS) are of great significance in promoting the prosperity and development of academic research, facilitating academic cooperation, and protecting academic heritage. Several methods for enhancing the DSS provided by university libraries are proposed by network research and literature research methods, including i) establishing a professional DSS team, ii) establishing digital scholarship research guides, iii) building digital scholarship space, iv) providing embedded course service in the center, v) promoting cooperation with other institutions to develop DSS, and vi) configuring digital scholarship resources. These methods were concluded from the present investigations in order to provide strong guarantees for the inheritance and development of academic research by researchers, promote the development of disciplines, and improve the quality of academic research.

**Keywords.** University libraries, Digital scholarship, Digital scholarship services

## 1. Introduction

As universities today have become increasingly connected and collaborative, libraries have become the engine and platform for knowledge creation, retention, sharing, and utilization [1]. With the rapid development of computer technology and information technology, digital learning is becoming a new service content for university libraries. The definition of digital scholarship (DS) is widely debated. On the basis of analyzing various interpretations of digital scholarship concepts abroad, Liu et al. summarized digital scholarship as “not only a digital technology, but also a new academic exchange model and teaching research paradigm, and also a digital scholarship product itself” [2].

DS is originated from the United Kingdom at the end of the 1990s and evolved on the basis of the concepts of electronic science, network infrastructure, and electronic learning. The Digital Scholarship Services (DSS) in university libraries in the United Kingdom and North America have developed for a long time and are relatively mature [3]. By establishing digital scholarship centers, assembling dedicated service teams, and constructing and planning digital research spaces equipped with software and hardware facilities, robust functionalities, and distinctive attributes, we empower faculty and students to overcome challenges encountered in academic pursuits within the current digital landscape. Gradually, these initiatives have cultivated distinct advantages and fostered DSS characteristics tailored to the university's developmental trajectory.

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Digitalization is the basic background of contemporary academic research, and improving the ability of DSS is an important issue faced by university libraries. Digital learning has triggered a revolution in the service mode of the library community, especially university libraries and research libraries. The advantages and significance of DSS in university libraries mainly lie in the following three aspects:

(1) Rich information resources

The library owns abundant and reliable documentary information resources. In particular, the digitalization and digitization of precious resources make exploring new forms, such as digital humanities research possible.

(2) Professional human resources

The library focuses on the organization, retrieval, and management of resources and can play a role in the collection, organization, publication, preservation, and reuse of digital resources, and can enable researchers to separate from the organization and storage of digital resources.

(3) Important infrastructure

The library owns a software and hardware environment for digital display, storage, publishing, open access, and data management, and provides all teachers and students with equal access to the library's software and hardware facilities, especially high-end hardware and professional software, to eliminate some inequalities caused by high prices or property ownership issues.

DS encompasses the entire process of knowledge production, knowledge organization, and knowledge exchange activities. It enables humanities research institutions and scholars to more conveniently collect, organize, analyze, and disseminate academic materials, thereby improving the efficiency and influence of academic research.

The provision of digital academic services by university libraries has profound significance in the modern academic environment, including promoting the sharing of academic resources, improving research efficiency, supporting open science, and driving changes in academic evaluation systems. These services not only adapt to the development of information technology, but also greatly promote the efficiency and quality of academic research. The purpose of this paper is to propose the methods for enhancing the DSS in university libraries to provide strong guarantees for the inheritance and development of academic research by researchers, promote the development of disciplines, and improve the quality of academic research.

## **2. Literature review**

Digital Science refers to a series of academic activities that use digital technology and tools throughout the research process of data retrieval, statistics, analysis, modeling, preservation, and publication. Such as geographical information system (GIS) and digital mapping, digitization of analog media/imaging, digital collection, metadata creation, digital storage, data monitoring and management, 3D modeling and printing, statistical analysis, digital exhibition, research project planning, digital publishing, text calculation and analysis, interface usability design, visualization, database development, technical maintenance, digital scholarship software development, etc.[3].

Ocranet *al.* assessed the role of academic libraries in digital scholarship at the University of Cape Coast and revealed that digital scholarship contributes to faculty

members' delivery through the provision of information literacy training for new students, provision of reference lists of materials available in the library and provision of lists of new materials [4]. Zhu focused on two particularly challenging issues facing Chinese academic libraries - space constraints and the trending of DSS and aimed to explore which spaces students and faculty wanted and how to leverage low-use spaces and growing DSS to build the Center for Digital Scholarship (CDS) to meet their demands [5].

Li *et al.* reported on a research study aiming to identify the user requirements of DSS in university libraries [1]. A set of strategic suggestions for DSS development were devised for library and information science researchers, library managers, and library manager professionals. Zhou *et al.* reported on a literature review that aimed to establish a guiding framework for the development of DSS in China's university libraries [6]. The framework was developed through systematically searching, screening, assessing, coding, and aggregating DSS.

Montoya *et al.* discussed the increased use of digital infrastructure in pedagogy by the Library Special Collections at UCLA [7]. The digital project collaboration approach can set the stage for more flexible and innovative digital instruction, building on the current skillsets of library staff to facilitate new modes of faculty and librarian partnerships.

Xu investigated the DSS of 36 foreign university libraries, including digital scholarship space, digital humanities services, scientific data services, academic exchanges and digital publishing, digital scholarship seminars and training, digital research tools, digital technology support services, etc. [8].

Liu investigated and analyzed 8 libraries as samples from five aspects: center overview, organizational structure, personnel allocation, space service, and academic support [9]. Deng analyzed the main practices of digital scholarship services in the American library community and gave some suggestions [10].

Er made an analysis of DS support in Canadian university libraries paying attention to the establishment of relevant departments, the history and current situation of their digital scholarship support, their teams of digital scholarship support, the publishing, and preservation of research results, the management of research data, support for teaching and curriculum, support for digital research projects, digital scholarship education, space support for interdisciplinary cooperation, and so on [11].

Tu and Xu surveyed the library DSS mainly focused on physical space services, digital research tools services, researching data services, discussing and training services, digital scholarship technology support, and so on [12]. Wang summarized the development history, development mode, and service guarantee of the digital scholarship service of the University of Illinois at Urbana-Champaign Library by case study and network survey and presented some suggestions to promote digital scholarship in China [13]. Er found that academic libraries in North America provide the DSS such as training courses, guidance, and education integrated into digital scholarship activities, cooperating with institutions and using a variety of ways for education [14].

Cox described the increase in different learning spaces as multi-sensory whereby users have the ability to shape their own learning space using a multitude of different tools provided by the library [15]. Ideally, the IT infrastructure requires minimal training for the users and no ongoing interventions from the service team. Examples include learning management systems, wikis, video streaming, individual and shared file storage, and virtual computer labs [16].

From the existing research mentioned above, these researches mainly focuses on summarizing and discussing the content and mode of DSS provided by many university libraries in Europe and America. However, there are relatively few studies that provide clear ideas and references for Chinese university library staff to try to form DS teams and determine the current service mode and content.

### **3. DSS in University Libraries**

#### *3.1. Establish a professional digital scholarship service team*

Given the variations in disciplinary distributions, user needs, and the library's inherent strengths, resources, funding, and personnel capacities, there exists no one-size-fits-all model for establishing digital scholarship centers. Research university libraries can either independently select an appropriate service model to establish their digital scholarship centers and institutions, tailored to their unique circumstances, or collaborate with other university entities to jointly set up such centers and institutions.

University libraries should clarify the objectives of DSS, develop digital scholarship service systems and standards, build a digital scholarship service management mechanism, guarantee and evaluate mechanism to ensure the sustainability of DSS, and build a digital scholarship service model and implementation plan on the basis of the established mechanism. At the same time, university libraries can, on the basis of understanding their own university culture, determine the functions and service contents of their own university libraries' DSS by evaluating various factors, such as organization scale, organization type, capital source, staffing, physical spaces, etc., and will adjust the service contents in time according to the process of service development and the service experience gained, provide a digital scholarship exchange, exploration and cooperation environment for university researchers.

The service personnel of the DSS team needs to have professional knowledge and be able to skillfully operate various digital scholarship research tools, and perform their respective functions in project management and coordination, data management and analysis, digital resource production and editing, institutional knowledge base construction, embedded course teaching, software and hardware tool use, multimedia digitization, and project training. Therefore, research-oriented university libraries should set up positions with different disciplinary backgrounds and skills according to the users' needs to help faculty and students plan, analyze, visualize, store, share, and publish digital projects. At the same time, university libraries should also create good training and learning opportunities for digital scholarship service personnel, and constantly update the knowledge system for carrying out DSS professionally.

University libraries can build a sustainable, coordinated, and harmonious digital scholarship service ecological environment by restructuring or reallocating human resources and strengthening the construction of service capacity. For example, to increase the setting and training of university science librarians, digital technology librarians, programmers, resource construction librarians, and other types of professional librarians, to focus on improving the professional skills and awareness of collaborative work of professional librarians. Furthermore, it is crucial to enhance coordination and communication with the university's human resources department and devise a comprehensive plan to recruit new librarians with multidisciplinary professional backgrounds, aligning with the requirements of a specialized librarian

workforce. Concurrently, emphasis must be placed on enhancing the professional competencies of librarians by facilitating opportunities for off-campus professional development training, as well as regularly organizing intra-library professional skill exchange sessions.

### *3.2. Establish digital scholarship research guides*

University libraries can provide some research guides for relevant information on the websites of their libraries for solving their problems. These research guides could include the access to the audio and video resources, file conversion, poster design, configuration scope and instructions of software and hardware equipment, audio and video editing and digital teaching video, and charging standards of advanced digital services. These research guides can also be quickly positioned according to different needs. The librarian will also update the guides regularly or irregularly according to the needs.

In addition, university libraries should build a multi-functional digital scholarship management and service platform, aggregate information knowledge, data resources, software tools, technical resources, etc. to increase the intelligent and one-stop search function, to improve the usability and visibility of the service platform, to create an interactive academic research space with digital storage, inquiry and answer, academic exchange, open access, display and demonstration, and online evaluation functions, and create activities such as finding, creating and sharing information through platform users, sharing knowledge and experience, knowledge dissemination, and academic publishing.

### *3.3. Build digital scholarship space*

The digital scholarship space is able to meet the complexity and diversity of users' needs and fulfill the mission of the university in the context of insufficient funds, space, and specialists [2]. On the one hand, university libraries can organize and optimize their library spaces, make use of the characteristics to carry out space design and reconstruction planning, and integrate library technical facilities, resources, and services to create digital scholarship space. At the same time, it is also necessary to standardize the rules for the use of space, such as making clear provisions on the management and coordination of space, the purpose of using the space, and the reservation of space use the time for making good use of space orderly and effectively. On the other hand, digital scholarship space can also be actively promoted through various publicity media of the library, so that digital scholarship researchers can understand the tools, resources, facilities, and functions of digital scholarship space. At the same time, libraries should take various ways to explore users' needs, improve the utilization rate of digital scholarship space, promote the development of digital scholarship research, and stimulate the enthusiasm of using space.

University libraries should fortify their infrastructural development in accordance with the specific conditions of their facilities, thereby providing a foundational guarantee for the effective implementation of DSS. The construction of a digital scholarship center is the demand of university libraries to adapt to the environment and development trend and shall have the following functions:

- The visualization function can provide a high-resolution visualization wall and touch screen interactive whiteboard for research data visualization and facilitate digital scholarship research.
- The discussion function can be equipped with high-performance computers, installed with digital scholarship research software, and can provide movable tables and chairs for digital scholarship research, discussion, training, counseling in order to promote digital scholarship exchange and cooperation.
- The consulting function is to set up a consulting room to provide one-to-one consulting services for digital scholarship projects.

### *3.4. Provide embedded course service in the digital scholarship space*

University libraries can embed in classroom teaching seminars or teaching practice training on the premise of cooperation between librarians and faculty according to their needs in courses or disciplines[11-12]. Providing professional and in-depth guidance services will improve the trust of faculty and students, and the development of cooperation projects will move towards a virtuous circle and gradually enhance the value of the library.

In addition, writing guidance services can be added to the DSS. The undergraduate students have a high demand for writing guidance, and each freshman student will be arranged individually customized librarian to provide comprehensive guidance services, including assisting students in completing their academic research tasks, such as how to prepare research papers, narrow down research topics, give writing suggestions, guidance and organize research content and accurate quotation.

### *3.5. Promote Cooperation with other institutions to develop DSS*

Cooperation is the foundation of DSS. University libraries should establish the concept of cooperation and jointly create DSS projects suitable for the development needs with the help of other institutions.

#### *3.5.1. Cooperate with other departments of the library to build digital scholarship space and software and hardware tools*

The construction of physical space and the configuration of hardware facilities need to submit planning opinions and planning applications to the relevant functional departments of the library. The provision of digital resources needs the participation of the staff of the library collection construction department. The configuration and installation of digital software require the professional staff of the technical department of the library to operate, implement, and provide technical guidance services [17]. The digitization and reading services of a special collection of digital or microfilm materials need to be completed in cooperation with the ancient books or special collection department of the library. Therefore, university libraries should coordinate and cooperate in human resources, technology, equipment, and other aspects to jointly complete the development of DSS in the university.

### *3.5.2. Cooperate with other university libraries to jointly promote the development of DSS*

The DSS of university libraries in many universities are still in the stage of exploring and gradually forming their own service system [13]. In order to improve the ability of DSS, university libraries should also cooperate to carry out DSS and exchange relevant experience. For example, university libraries can cooperate with other libraries to develop services, form alliances, exchange experiences in the preparation of DSS, the content and methods of DSS, and create a good digital scholarship exchange environment and conditions, so as to improve the overall level of DSS of university libraries.

### *3.6. Configure digital scholarship resources*

University libraries should configure various types of hardware equipment in the digital scholarship space, such as scanners, video recorders, digital cameras, mapping and positioning instruments, demonstration and projectors, display screens, tablet computers, and calibration tools on the premise of investigating and understanding the users' needs for digital scholarship research tools and in combination with the funding situation of the library.

At the same time, corresponding software is configured to match the use of these hardware facilities, such as office software, scanning software, digital editing software, audio and video digitization software, audio and video editing software, desktop publishing, and image editing software[2][17]. According to the characteristics of the digital scholarship space setting or the academic background and personalized needs, the resources and services of software and hardware are allocated, the use of tools is guided, and the value of the space is improved, so as to attract more users to carry out learning and scientific research activities.

The characteristic collection resources are important resources for the research of digital scholarship. University libraries should strengthen the development of the characteristic collection resources. First of all, university libraries should sort out the existing characteristic collection resources and excavate the characteristic resources such as local chronicles, ancient books and documents, and celebrity genealogy with research value. Secondly, university libraries should use data processing, data storage, system development, and other related technologies and provide resource guarantee for discipline professionals to carry out in-depth research on digital humanities.

## **4. Conclusion and perspective**

DSS is the future development trend of university libraries. The vigorous development of DSS has changed the original knowledge exchange ecology. The developments pose both a challenge and an opportunity for research university libraries to continue innovation and development. In this paper, we proposed some key suggestions which include six aspects to improve the development of DSS for university libraries.

The research university libraries need to re-embed into the whole process of academic life and academic exchange, undertake key functions in the fields of information acquisition, content digitization, content discovery, and dissemination, and expand the service content in the areas of copyright consultation, open access

publishing, data monitoring, and management. The research-oriented university library consistently occupies the vanguard of innovation and enhancement endeavors, amassing a cohort of professional adept at leveraging cutting-edge technologies. Therefore, it should give full play to its own resource advantages and service advantages, learn from the digital scholarship service experience, concepts and models of some experienced libraries, form a digital scholarship service system suitable for its own development, fully support scientific research, promote knowledge innovation, and continuously enhance the academic influence of the library.

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