

Research on the Construction and Service Mode Innovation of Open Mobile Knowledge Base in Higher Vocational Colleges

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Abstract: This article focuses on the construction of open mobile knowledge base (OMKB) in higher vocational colleges (HVCs), and adopts the methodologies of documental analysis, questionnaires, surveys and case studies to analyze OMKB in HVCs in China. Then, through the analysis of domestic and foreign data, it can be seen that the current storage volume of knowledge base of scientific research results in Chinese universities is far below the level of western developed countries. Conducting the construction of OMKB in HVCs can better comply with the trend of social development, meet the knowledge needs of the public, and form the complementarity between different institutions. However, in reality, there are still some problems and deficiencies in the OMKB service mode of HVCs, which emphasize information collection rather than knowledge application, paper literature rather than electronic data, on-campus service rather than social service, and existing knowledge rather than creative consciousness. Therefore, on the basis of full investigation and analysis, this paper proposes that the optimization path of the OMKB service mode in China's HVCs is: exploring the joint mode of cooperation between universities and society, and operation and management, improving the system platform and funding sources, and making good storage and sharing of resources. The innovation of the OMKB service mode of HVCs in China can achieve the following: carrying out innovation and improvement, laying social foundation, promoting innovation of resource evaluation system, protecting the innovation of intellectual property mode, co-construction of the HVCs' alliance knowledge base system innovation, technological innovation, - applying the advanced technology of CRIS, helping China's HVCs' knowledge base construction transformation and upgrading.

Keywords: Higher vocational colleges (HVCs); Open mobile knowledge base (OMKB); Service mode innovation

Introduction:

Presently in China, in the wide-ranging regions but especially in the less developed remote areas of the Inner Mongolia Autonomous Region, there is an urgent need to improve problems in distance education at higher education institutions, and at higher vocational colleges. These issues include how to reform, upgrade and improve the old knowledge system, information database management and services using new technologies. This paper takes the construction of open mobile knowledge base (OMKB) and service mode innovation at higher vocational colleges as the study and analyses the current situation of the construction of OMKB in China's higher vocational colleges, i.e. the knowledge system is relatively old, the utilisation rate is low, the service scope is narrow and there are gaps with practical uses. After more than fifteen years of continuous observation and cooperation exchanges with Chinese higher vocational schools, and the recent six months of direct visits, remote audio and video communications, online and offline questionnaires, etc., using a large number of data analysis, case studies and other necessary research methods, this paper summarises and analyses the construction, management, and service mode innovation of the open mobile knowledge base in Chinese modern higher vocational colleges, and proposes specific implementation measures, and a methodology for optimising the roadmap and service mode innovation.

1. Introduction to the Current Situation of OMKB Construction in HVCs

An open mobile knowledge base (OMKB) is a new type of database that adapts to the current level of desire for knowledge. Mobile means that it is not restricted by geographic location and regional scope and can be accessed through knowledge data access platforms; open also means that it is openly accessible, free of charge on public networks, and allows the operations of reading, downloading, copying, transferring and collection of information. In Japan, the Japan Consortium of Open Access Knowledge Base (JPCOAR) was established in 2016 to emphasize the development of paths for universities to undertake scientific research work, promote the exchange and integration of educational resources and research information in universities, and promote scientific research knowledge information.¹ In the United States, institutional knowledge bases of universities have also been established, and the scope of acceptable and usable knowledge bases of each university varies, mostly involving dissertations, conference papers, publications, research reports, etc., and the digital format of the contents is supplied and opened.² Compared with western countries, the research

1 Sun Haiyan, Xie Dengfeng. The Open Access Strategy and Enlightenment of JPCOAR of Japan Association of Institutional Knowledge Base [J]. Digital Library Forum, 2019 (06)

2 Yang Mingxi. Survey on Open Access Policy of Knowledge Base of American University Institutions [J]. Library Construction, 2018 (08)

on OMKBs in higher vocational colleges in China started relatively late, and the theoretical research is still in the exploration and development stage. Although China has established the China University Institutional Knowledge Base Alliance, on the whole, there are only 46 member institutions. As seen in Table 1-1, there is still a big gap between the number of knowledge bases stored in China compared to that of developed countries in the West.^[1]

Table 1-1: Statistics on the storage volume of knowledge base of scientific research results in some national open access universities³

Country	IR No./Unit ¹	IR N<1K	IR 1≤N<5K	IR 5≤N<10K	IR 10≤N<100K	IR≥100K	Total/10K
US	373	191	89	31	52	10	275
UK	192	108	44	15	22	3	47.5
Japan	135	61	38	14	20	2	28.5
China	13	10	1	1	1	0	0.65

From the perspective of research direction, most of the relevant researches on the service mode of OMKB in domestic HVCs are basic at present. The focus of the research is on the collection and retrieval of resources, as well as the innovation of the service mode and the provision of personalized services. From the research results as of April 4, 2021, I searched the keyword “open access” in China National Knowledge Infrastructure (CNKI). There were 24,300 results, among which there were 21,100 foreign related articles versus only 3,326 from China. The early research on open knowledge bases in China was Qiao Dongmei’s *The Development of the Open Access Movement in Scholarly Communication* and Li Wu and Liu Zheng’s *A New Scholarly Publishing Model: Open Access Publishing Model*. The keyword “knowledge base” was searched on CNKI, and 39,000 results were obtained, among which 31,400 were domestic Chinese documents. Among them, *Parallel Database and Knowledge Base System*, written and researched by Renmin University of China in 2001, is the earliest research paper on knowledge base construction in China. Thus, it can be seen that the current status of domestic research on “open access” is in line with the rhythm of digital technology development on the Internet in China, and there is a sufficient practical need and value to carry out this research.^[2]

2. The Realistic Need for The Construction of OMKB in HVCs

2.1 Satisfying the Knowledge Needs of The Public

Today we are all in an information explosion society. In front of the vast amount of data, the public plays the role of a recipient of knowledge and information, but this can no longer meet the public’s multi-dimensional needs for knowledge and information. The construction of a MOKB has its advantages over traditional libraries and information bases and can better serve the public. The mobile knowledge base can better provide information services according to the public’s knowledge and information needs, and can improve the efficiency of the use of knowledge. At this stage, the mobile knowledge base is highly integrated with the Internet, so it can combine the needs of each audience and carry out realistic analysis, so as to achieve the target. It can, on one hand, better meet the public’s knowledge needs; and on the other hand, maximise the benefits of knowledge resources.

2.2 Forming Complementarity Among Different Institutions

For knowledge bases, the traditional literature resource construction is no more than literature acquiring and cataloging, which is limited by book suppliers, funds, and the size of the library and so forth. Thus there are certain limitations. It is very certain that no single knowledge base can include all published books and documentary items. In addition, due to the characteristics of public libraries themselves, their local literature collections have very obvious regional characteristics. The open knowledge base sharing mode allows public libraries in different regions to share their knowledge and make up for their disadvantages by taking what others have. It can also effectively avoid the duplication of literature resources, which is a win-win mode. For other industries, the open sharing mode of knowledge base literature resource construction gives each other an opportunity to exchange and cooperate, and the integration of different disciplines has become the development trend of scientific research.^[3]

2.3 In Line with The Trend of Social Development

The Public Library Law of the People’s Republic of China, which was implemented on January 1, 2018, clearly puts forward that the state supports public libraries in the common construction and sharing of documentary information. Public libraries are required to “carry out joint procurement, joint cataloguing and joint services to achieve joint construction and sharing of documentary information, and to promote the effective use of documentary information”. At the same time, it is also proposed that “public libraries should provide documentary information and related consulting services for state agencies according to their own conditions”, to find out the needs of the public and provide information services. This regulation has clearly reflected the trend of social development and the need for knowledge base in the process of social development. The construction of mobile knowledge base is precisely bred in such an environment. The mobile knowledge base is a response to the expectation and demand that “knowledge resources are a public resource”, and it is an initiative to promote sustainable global knowledge sharing.

3. The Current Situation of The OMKB Service Mode in HVCs

3.1 Emphasis on Information Collection Rather Than Knowledge Application

According to the author’s own investigation, the construction of OMKB in domestic HVCs is mainly in some basic functions, focusing on the collection function of literature and library materials, and the service function is lacking. For example, the service functions of Xilin Library are mainly achievement collection and personal scientific research assistance. The construction of OMKB in domestic HVCs is still in the exploration stage or the initial stage, so its service functions and service items are still relatively few. Facing the rapidly developing society, the traditional library’s characteristic of emphasizing collection and neglecting application is no longer applicable to the needs of social development at this stage.^[4]

³ Zeng Huaming. Research on the Construction of Knowledge Base of Scientific Research Achievements Based on Open ccess [J]. Information Exploration, 2021 (01)

3.2 Emphasis on Paper Documents Rather Than Electronic Data

The construction and insufficient storage of data resources is one of the main problems in the construction of OMKB in HVCs at present. The traditional printed materials and academic journals have a long history and have been generally accepted by people. However, new academic resources such as network data resources, conference video resources, course audio resources and other data resources lack timely collection and arrangement. The public is not familiar with such data resources, coupled with the lack of public access to such resources, that resulted in the public's low acceptance. Based on factors such as insufficient public understanding, single use method and low recognition, the utilization rate of electronic data resources in the mobile knowledge base is generally low, and not yet generally recognized and accepted by the public.

3.3 Emphasis on On-Campus Services Rather Than Social Services

At present, most of the OMKB services in China's HVCs are aimed at on-campus personnel or on-campus students, while off-campus users cannot fully utilize the data resources of the bases. For instance, many HVCs' knowledge bases are only used within the schools, or within the faculty and students, and the data resources are not accessible to people outside the campus. This limits the role of knowledge base resources to a certain extent, and also causes a certain degree of waste of data resources. According to the author's survey in eight typical colleges and universities in Beijing, most of the existing knowledge bases in some undergraduate institutions as well as in China's HVCs are not fully constructed with an open system for internet users and social users, and are mostly dominated by on-campus students and staff in terms of openness and access to resources.

3.4 Emphasis on Existing Knowledge Rather Than Creation Awareness

A knowledge base with rich data resources is a key factor for data exchange and academic communication. However, in reality, most of the data in the knowledge bases of HVCs are collections of existing knowledge and certain compensation for the collected knowledge. But for the selection and collection of innovative knowledge, some HVCs do not do enough in a timely manner, especially some new academic and scientific research results are not included timely. Therefore, the mobile knowledge base of HVCs needs sufficient data resources to enrich the contents. If the participants do not actively innovate or submit relevant data material contents, it will affect the overall quality of the knowledge base, and also affect the continuous development of it.

4. Optimization Path of the OMKB Service Mode in China's HVCs

4.1 Explore the Joint Mode and Operational Management of University-Society Cooperation

The knowledge base of colleges and universities involves the knowledge sharing of multiple schools and requires strong social technical power. It is possible to collaborate on a subject in the process of strengthening the knowledge base of universities and society, with universities in the region first building their own knowledge base on this subject; The same applies to public libraries, which build their own knowledge bases in a particular discipline. After each university and public library has built its own knowledge base, the data of each member institution will be stored and managed centrally, and a unified data retrieval platform will be built. Once the unified search platform is completed, the data will be integrated to achieve a joint supply of data from universities and public libraries. Universities and public libraries can set up teams including technical staff, and consultants, etc. to take responsibility for data management and post-maintenance.^[5]

4.2 System Platform and Funding Sources

Parties in knowledge base construction can build their own search platforms using software such as Dspace in a unified manner to ensure compatibility between platforms. It is also necessary to embed citation management software Zotero, writing aid Authorea and supplementary storage software Google Drive on the unified retrieval platform. In addition to building the corresponding system platform, adequate funding must be prepared. Policy funding support from the competent authorities is the main source of funding. Funding and support from universities and various third-party organisations are also required. In addition, a certain amount of fees and funding from the corresponding data users is also an option.

4.3 Storage and Sharing of Resources

The copyright of data resources is an important element in the construction of a knowledge base. Members of knowledge base must use unified standards in data extraction, index creation, resource classification and citation. Information such as subject, person in charge, institution, abstract and time are set in a particular subject area. Data resources should be stored with uniform regulations such as content, format and copyright. When the knowledge base collects resources for storage, it must require the resource provider to provide the copyright attribution of the resources, and later when the copyright of the resource occurs the copyright transferor is required to provide the new copyright attribution of the resource. In the sharing policy, the federated platform can set a "First OA Policy", i.e. the OA policy with a higher degree of sharing is applied to the general resources, and the OA policy adapted to the specific resources is then selected. Consideration should also be given to deprivation or confidentiality of private or confidential content when developing specific OA policies.^[6]

5. Innovative Research on the Service Mode of OMKB In China's HVCs

5.1 Carrying Out Innovation and Improvement and Laying the Social Foundation

To do well in the innovation of exploring the OMKB mode in HVCs, a certain social environment foundation must be available. Firstly, it is necessary to promote the formation of more high-tech talents who understand the opening and acquisition of knowledge bases, and to set up working groups or expert groups to train the staff of OMKBs and enhance core working skills; Secondly, to carry out training, studies and lectures on mobile knowledge base service modes, to enhance the awareness and efficiency of the use of OMKBs by social personnel, and to enhance the ability to apply knowledge bases. Specific ways of publicity can include: promoting the functions and services of mobile knowledge bases through lectures, exhibitions and websites, so that more researchers and social personnel can understand the operation mode and unique advantages of mobile knowledge bases, increasing the influence

and visibility of mobile knowledge bases, encouraging them to deposit better data resources into mobile knowledge bases, and also supporting them to obtain the resources they need in the mobile knowledge bases resources for their own work and learning. For those who upload quality data resources, they should be given certain rewards and compensation, so as to encourage more scholars or experts to transfer quality data resources into the mobile knowledge base, and improve the overall data resource quality of the mobile knowledge base.

5.2 Innovation of Resource Evaluation System

Establishing unified standard attributes and format requirements. The classification and data of each university after the knowledge base is shared will affect the access to knowledge and the exchange of information if there is a lack of unified format requirements and different levels of detail in the description. While encouraging experts and scholars to upload quality data resources, it is firstly necessary to establish a complete set of applicable evaluation criteria and format requirements for use. Secondly, the relevant data content uploaded to the knowledge base should be evaluated and reviewed. Documentation of lower quality and misdirected data resources should be promptly rejected accordingly. Guidance is to be provided for resources that can be uploaded to the knowledge base after revision. Data resources and documentation with errors in orientation are prohibited from being uploaded and blocked. A professional knowledge base data maintenance team should be set up, who will gatekeep and review the vertical and horizontal knowledge base resources. At the same time, appropriate experts are regularly engaged to conduct sample checks on some resources within the knowledge base, and data resources that fail to meet the standards will be taken down and removed. Modifications are proposed to data resources with quality problems, and timely feedback is given to data resource uploaders to facilitate data updates, self-improvement and modifications.

5.3 Innovation in The Mode of Intellectual Property Rights Protection

Intellectual achievements must be protected in the process of construction and service of knowledge bases, so in the process of building OMKBs in HVCs, strict property rights protection systems and policies should be formulated, covering a range of issues such as reproduction rights, online distribution rights and privacy rights. Failure to protect intellectual property rights is an infringement on the owners of intellectual property rights, and is also detrimental to the innovation of knowledge and the development of science and technology in society as a whole. Therefore, intellectual property protection is a very important part of the process of building an OMKB in HVCs. During this process, the relationship between the rights and obligations of HVCs, resource providers and resource users should be clarified. The data resources submitted by the resource provider shall not infringe upon the intellectual property rights of others, and the resource users shall not impersonate or infringe upon the rights of the resource provider in the process of use. In the process of providing knowledge base resources, HVCs shall reasonably coordinate the rights and obligations of both parties and ensure the ownership and use rights of data resources of both parties.

5.4 Innovation of The Knowledge Base System of The Alliance Of Hvc

In the process of building an OMKB in HVCs, a certain university alone may be insufficient in terms of data types and data quantities. However, if it can unite with other knowledge fields, or various universities in this field for cooperation, it will greatly enrich the data types and data quantities in the mobile knowledge base. China's HVCs can take the form of an alliance of central knowledge bases, such as continuing to strengthen communication with the Chinese Universities Institutional Knowledge Base Alliance, encouraging more HVCs to join in, placing different subject classification areas under the responsibility of different universities to take the lead, encouraging multiple styles of sharing and analysis, and taking responsibility for the data quality of the entire university alliance mobile base. At the same time, it also promotes the integration of existing on-campus library resources and mobile knowledge base resources, carries out integration work from the perspective of traditional bibliographies and knowledge base bibliographies, integrates a unified search platform, and centralises the integration of in-library data and knowledge bases. As such, diverse modes of collaboration can be coordinated to enhance the integration and operation of data resources.

5.5 Technological Innovation - Using CRIS Technology to Help China's University Institutions Transform and Upgrade Their Knowledge Base Construction

CRIS meaning the Command Resource Information System. It combines a powerful spatial information system with a powerful point source subject database system to manage and process not only resource data with two-dimensional spatial distribution characteristics, but also multi-source, multi-class, multi-volume, multi-dimensional and multi-topic resource attribute data. It is a kind of integrated technical system with multi-database association and multi-S integration. At present, the development and application of CRIS technology has certain inspirational effects on the construction of institutional knowledge bases in Chinese universities. As a new trend in the development of institutional knowledge bases, HVCs should introduce CRIS through research in order to strengthen the internationalization attributes, interoperability specifications, semantic association characteristics and open access influence in the construction of institutional knowledge bases in universities.

6. Conclusion

The OMKB in HVCs provides a new mode for academic research and resource application, and is a trend and an important area for the development of traditional libraries. Although the construction of OMKBs in HVCs in China is still at the exploration stage, a mature mode has not yet been formed, and there are certain shortcomings and problems, and the service mode still needs to be improved and optimised. However, with the development of the big data era and the universal application of the network, the application of OMKB in HVCs will certainly have a broad market future and will be recognised and supported by more teachers, students, experts and social workers. In the process of building an OMKB for HVCs, the constructors should fully draw on the advanced experience of foreign countries, combine the specific reality of self and the unique advantages of various database resources, and explore a data service mode that meets the national conditions and realistic needs, so as to contribute to the development of science and technology and the development of culture in and beyond the country.

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Footnotes:

1. IR No./Unit: The Institutional Repository (IR) indicates how many open university repositories are. $IR0.1 \leq N < 5,000$ indicates the number of open storage databases from 1,000 to 5000.
2. Proceedings of the 34th Annual Conference of Asian Association of Open Universities (AAOU2020) held from 21-23 October 2020 at Cinnamon Grand Hotel, Colombo, Sri Lanka.