Research on User Profiling Construction of University Researchers

Based on Institutional Knowledge Base

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Abstract. Based on the analysis of the characteristics of scientific research personnel's knowledge needs, a model for constructing university scientific research personnel portraits based on institutional knowledge bases is proposed to meet the practical needs of scientific research personnel portraits. This model accelerates the implementation of scientific research personnel portraits, promotes the transformation and development of university institutional knowledge bases, and enhances the core competitiveness of libraries.

Keywords: University library; User profiling; Institutional knowledge base; Researchers

1 Introduction

University researchers refer to individuals (such as teachers, graduate students) or groups (such as research teams) engaged in scientific research. These library users have high academic literacy and abilities, and their research has strong domain characteristics. Their knowledge needs and goals are highly specific, making them a special type of library user who requires the library to provide in-depth information services that accompany the scientific research lifecycle. The research paper focuses on scientific researchers and institutional knowledge bases as the main data source, aiming to construct a simple and operable user profiling method that can be applied in practice to strengthen the correlation between scientific researchers and institutional knowledge bases, and enhance library services and competitiveness.

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2 Realistic Demand for Portraits of University Researchers

2.1 Necessary Requirements for the Knowledge Needs of Researchers

Researchers are the backbone of universities to enhance their level of scientific research and academic innovation. The conventional subject navigation provided by libraries can provide some directional assistance for newly recruited researchers, but it is difficult to meet their academic innovation needs. In order for libraries to better fulfill their responsibilities and functions in supporting scientific research and innovation, they must perceive the needs of researchers and achieve rapid search, matching, and push of resources. The knowledge needs of researchers typically include cutting-edge research topics, literature search and measurement, comprehensive databases, data management and analysis tools, and selecting appropriate publications. These knowledge needs are currently the focus of library services for researchers; However, researchers also have developmental and expectation based needs such as open storage, shared services, collection and research of relevant literature and information knowledge, selection of research teams, management of research projects, and providing guidance and evaluation for research plans. These knowledge needs should become the research focus and development direction of library service research[1].

2.2 The Inevitable Requirement for Precise Library Services

The diverse needs of users in using library resources and services, providing targeted services for different types and even individual users, identifying user demand points, and actively and reasonably matching resources are important factors for libraries to achieve accurate services. For university libraries, profiling scientific researchers can fully reflect precise and proactive services. University libraries focus on professionalism and depth in providing resources and services for scientific researchers, which not only conforms to the characteristics of precise, efficient, and intelligent services, but also enhances the core competitiveness of university libraries, promotes the development of disciplines and the improvement of teaching and research levels, and assists in the construction of "Double First Class" universities[2].

2.3 The Inevitable Requirement for the Transformation and Development of Institutional Knowledge Base

The institutional knowledge base is a platform for university libraries to store and effectively manage the research achievements of their own institutions. At present, the institutional knowledge base data of university libraries mainly relies on external databases for acquisition, and internal users of institutions rarely actively submit or reference data, which gradually separates the institutional knowledge base from the scientific research process of universities. A large amount of data resources cannot play their due role in scientific research activities, facing the embarrassing situation of researchers not knowing what they are used for and library personnel not knowing what they are

built for. The situation of "shelving it" is becoming increasingly prominent. The institutional knowledge base, which mainly focuses on resource storage, simple indexing, basic retrieval and utilization, is facing an urgent need for transformation and development. To achieve transformational development, institutional knowledge bases must be oriented towards the entire process and cycle of scientific research. The core is to be oriented towards research and contribute to innovation, becoming a "think tank" for scientific research managers and staff[5].

3 Construction of Portraits of University Researchers

User profiling is a typical data processing method[3], which essentially involves a deep understanding and precise expression of personality traits based on various data analyses, manifested in the form of user tags[4].

3.1 Characteristics of Knowledge Needs of University Researchers

The knowledge needs of scientific researchers are mainly reflected in four aspects: PhD, accuracy, speed, and novelty, namely the comprehensiveness, precision, real-time, and dynamism of scientific research knowledge needs. The knowledge needs of researchers vary slightly with the changes in the research process. In the topic selection stage, emphasis is placed on knowledge needs such as historical literature analysis and cutting-edge trends; During the project application phase, focus on knowledge requirements such as literature review writing; During the project research phase, the focus is on knowledge requirements such as academic information tracking, scientific research data management, and achievement dissemination; After the project is completed, the focus is on knowledge needs such as the release and transformation of scientific research achievements[1].

3.2 Data Collection

Data collection is the foundation for building User profilings, with data from institutional knowledge bases as the main source and data resources from library business management systems as supplementary sources. It mainly involves user attribute data, user achievement data, and user academic and social data. By analyzing the inherent attributes and behavioral labels of users, a set of user portrait labels is generated. The portrait label model mainly consists of two aspects: user demographic labels and research attribute labels[2][6][7][8].

User Attribute Data. User attribute data includes structured data such as the user's name, gender, education level, department, professional title, research direction, personal academic resume, and total number of published papers. These data remain stable for a certain period of time and can be supplemented and improved from the library reader management system. They are relatively easy to obtain and belong to the basic data of user data.

User Achievement Data. User achievement data refers to the research and academic achievement data collected from institutional knowledge bases, including user research achievement titles, keywords, abstracts, publication years, citations, etc. These data can directly and effectively reflect the research directions closely related to user research behavior, reflect the research focus of users during a certain period of time, and are key and core data for outlining User profilings.

User Social Data. User social data mainly refers to the personnel data in the institutional knowledge base that jointly form academic achievements with users. These data can reflect users' academic associations, cooperative relationships, etc., and are a supplement to user attribute data, used to outline users' academic social grid models.

3.3 Data Processing

The raw data is insufficient to construct User profilings, and the collected data must be cleaned, processed, mined, and analyzed. According to the constructed knowledge organization model and data structure, knowledge items are generated in sequence and stored in the knowledge base to form high-quality standardized data. Taking user achievement data as an example, in order to reduce workload and implement technology, natural language processing and clustering algorithms are mainly combined. Academic paper abstracts are selected as the main corpus to extract and cluster text information. Then, based on the clustering results, the classified categories are annotated to form user tags and characterize user research interests.

3.4 Label Modeling

Label modeling is the core process of user profiling, including the construction of user demographic labels and research attribute labels. On the basis of individual user tags, clustering algorithms are used to classify users with the same or similar tags, forming two categories of group user tags. The user individual population label model mainly includes attributes such as age, education level, professional title, and major; The user group population label model mainly includes attributes such as group name (unit, team, etc.), affiliated institution, etc; The user's individual research attribute label model specifically reflects the actual situation and research strength of individual researchers, mainly including keywords, number and annual average of published papers, citation status of papers, most commonly published journals, highest cited papers, and research awards obtained; The user group research attribute label model mainly reflects the current situation and research strength of research teams or institutions, including the composition of professional titles, number of published papers, and high publication journals of the group; The user academic influence label model involves the evaluation of scientific research innovation in the field, mainly including user job titles, academic positions, scientific research awards, and other attributes.

3.5 Data Update

The update of institutional knowledge base data is slow, mostly on an annual basis, and the research direction and interests of researchers continue to evolve over time, requiring timely updates of user models. When updating data, it is necessary to calculate time weights for the interest dimension so that interest labels can more accurately reflect the recent research interests of researchers. In short, it is to assign higher weight values to the latest keywords, and control the parameters based on their frequency and quantity of occurrence to obtain a more reasonable keyword score. In the case of sufficient data, a demand forecasting model can also be established to predict the potential demand of users in the future, and provide research trend forecasting services, providing direction and basis for research planning of researchers.

4 Application of Portraits of University Researchers

4.1 Transformation and Construction of Institutional Knowledge Base

The institutional knowledge base has always played the role of a "traditional data warehouse" in the academic field, achieving the goal of aggregating internal scientific research resources and reorganizing knowledge; But the data resources gathered by it have not been able to play their due value in scientific research activities. By conducting user profiling of university researchers, the research value of institutional knowledge base data resources can be explored, promoting academic exchange and research innovation; Can deepen the connection between institutional knowledge base data resources and scientific research academic data, and assist in scientific research data management and data sharing; Being able to stimulate users' enthusiasm for using institutional knowledge bases and promote the transformation of institutional knowledge bases into institutional think tanks is the only way for the transformation and development of institutional knowledge bases[5][9][10].

4.2 Precise Service of Library

By conducting user profiling of university researchers, libraries can gain a deeper understanding of users' disciplinary needs, explore precise disciplinary services led by first-class and key disciplines, and take into account all disciplines. They can actively engage in users' scientific research activities, provide high-level services such as disciplinary resources, information, data, and intelligence, improve the depth and breadth of disciplinary services, recommend collection information that meets the literature resource needs of target users and user groups, achieve accurate push services for collection resources, and optimize personalized push services for smart library users; Based on the similarity characteristics of target users, utilizing the correlation of tag information to generate a target user group containing similar resource requirements, achieving precise resource push services for similar user groups; By mining users' potential needs through User profilings, we provide users with tracking of academic hotspots,

predicting development trends, avoiding research blind spots and misconceptions, and improving research efficiency[2].

4.3 Academic Exchange Services

Academic exchange is an important driving force for the continuous development and innovation of scientific research. By conducting user profiling libraries for university researchers, it can provide a platform and opportunity for academic exchange for researchers. On the one hand, academic communities can be established for researchers in the same disciplinary field in universities, guiding users to exchange disciplinary information and research hotspots, share research experiences and phased achievements, and provide timely assistance for users to overcome research difficulties; On the other hand, it is possible to establish affiliated communities for researchers from different research fields in universities, guiding users to exchange research hotspots in their respective fields, understand research hotspots in interdisciplinary fields, and provide a communication environment for conducting interdisciplinary research.

User profiling, as a technical method, is applied to accurate library services by analyzing and mining institutional knowledge base data and library basic data, depicting user characteristics, mining user research interests and preferences, predicting user resource needs, and other methods. It can enhance the comprehensive benefits of library resource construction and services[6].

5 Conclusion

There is a considerable amount of research literature on user profiling in domestic libraries, which has laid a solid foundation for application and service in terms of research content, research methods, research fields, and research ecology. However, from the perspective of practical application in libraries, there are still many problems and current situations: how to protect user privacy, how to measure user innovation experience, how to determine the granularity of user profiling, how to evaluate the input-output benefits of libraries, how to determine the appropriate application scope, etc. All of these should be properly designed based on the actual situation of libraries, so that technical methods can truly become the wings of library development.

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