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Retraction

Retracted: Research on Information Retrieval Effectiveness of University Scientific Researchers Based on Mental Model

Wireless Communications and Mobile Computing

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] Y. Zhang, Yiyang, and J. Yang, "Research on Information Retrieval Effectiveness of University Scientific Researchers Based on Mental Model," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 5852946, 7 pages, 2022.

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Research Article

Research on Information Retrieval Effectiveness of University Scientific Researchers Based on Mental Model

Yundi Zhang [iD],[1] Yiyang [iD],[2] and Jinshan Yang [iD][3]

[1]*Changchun Institute of Technology, Changchun, Jilin 130021, China*
[2]*Changchun Engineering Institute Design and Research Institute Co., Ltd., Changchun, Jilin 130012, China*
[3]*Jilin Provincial Institute of Education, Changchun, Jilin 130012, China*

Correspondence should be addressed to Yundi Zhang; 202014000638@hceb.edu.cn

The information retrieval behavior of scientific researchers is a behavior that is affected by multiple factors such as cognition, emotion, task, and user type and has its unique cognitive characteristics. In the context of scientific research, this paper conducts research on the information retrieval behavior of scientific researchers and analyzes the three levels of user mental model "user cognition, user behavior, and user emotion." According to the mental model construction process, define the user segmentation of basic tasks, formulate recruitment plan, set interview scope, analyze data, construct mental model, product adjustment and gap analysis, export structure seven steps, construct the mental model of scientific research workers' information retrieval, carry out research on the information retrieval efficiency of scientific researchers, describe the user portrait based on the mental model, and put forward strategies to improve the efficiency of user information retrieval.

1. Introduction

Information retrieval is an indispensable link for scientific research workers. The information retrieval behavior of scientific research workers is a kind of behavior under the joint influence of many factors such as cognition, emotion, task, and user type, which has its unique cognitive characteristics. The efficiency of information retrieval also directly affects the scientific research efficiency of researchers. Mental model is a research method of psychology and has made many achievements in many application fields. The concept of mental model was first put forward by psychologist Kenneth Craik in 1943. He believed that mental model can predict the danger in unfamiliar environment and help human beings reduce their potential harm [1]. Professor Johnson Laird further developed the mental model, which made the concept of mental model really come into being. He proposed to use the mental model to understand people's cognition, experience, and knowledge structure of the real world. Because of the differences in individual cognition, the mental model is iterative and corrective [2]. The most frequently cited definition of

mental model in recent years was proposed by Rouse and Morris in 1986. Rouse and Morris think that mental model is a psychological mechanism or established cognitive framework by which people describe the goals and forms of the system, explain the functions of the system, observe the state of the system, and predict the future state of the system. People use mental model to improve the efficiency of cognitive activities [3]. In the field of management, the theory of mental model has been further extended, Johnson-Laird's definition of mental model is that for a single individual's understanding of the relationship among himself, other individuals, and groups, it assumes the way of social operation, and it is its main function for people to explain and describe the causes of phenomena and predict possible follow-up events in order to avoid or control them in time [4]. After the publication of the Fifth Discipline, the theory of mental model is well known in the field of management, and mental model plays an important role in the process of human cognition of the world. It is mentioned in the book that the mental model is deeply rooted in people's hearts, and it is about the cognition of individuals, others, society, and the world [5].

Applying mental model theory to the research of users' scientific research behavior, it is a further exploration of the application of mental model theory, by analyzing the information retrieval behavior of scientific research users [6]. This paper constructs a mental model of information retrieval behavior of scientific research users from three levels, user cognition, user behavior, and user emotion, and applies it to the evaluation of user information retrieval efficiency and scientific research efficiency, in order to further improve the scientific research efficiency of scientific research users.

2. Construction of Mental Model of Information Retrieval Efficiency for Scientific Research Workers in Colleges and Universities

2.1. Basic Experiment of Mental Model

2.1.1. Preparation for the Experiment. Mental model is the basis for individuals to recognize, think, and act internally and externally. Everyone has mental model, which determines our perspective of observing things and relevant conclusions. Mental model is a relatively abstract concept, so it is necessary to explore users' mental information by establishing experiments, extract abstract information, transform it into concrete information, and analyze and evaluate it.

The purpose of this experiment is to preliminarily construct the mental model of the target users, through interviews with scientific research workers, users can reproduce information retrieval scenes and answer corresponding questions, so as to discuss users' scientific research behavior and information retrieval behavior mode, and obtain information such as cognition, retrieval demand, motivation, preference, habit, and evaluation of scientific research workers in the process of information retrieval [7, 8].

2.1.2. Experimental Research Methods. This experiment constructs the mental model through two stages. The first is the representation and extraction of mental information, using certain methods to express the thinking activities and behaviors of the target users and extract the mental information of the target users. At this stage, focus groups and interviews, questionnaires, card classification, and other three research methods. The second is to analyze the data of the mental model and evaluate and analyze the mental information extracted from the previous stage. Commonly used methods of mental model data analysis include affinity graph method, concept map calculation, path search method, multidimensional scale method, and cluster analysis [9]. In the real process of building a user's mental model, it is difficult to obtain a complete mental model by a single measurement method. To obtain different mental models, various methods are usually used to obtain them in combination with the research objects.

2.1.3. Selection of Subjects. In order to obtain the mental model of scientific research workers' information retrieval more effectively, the users selected in the early research should be more targeted and meet the target user groups of products. This research mainly focuses on the information retrieval behavior of scientific research workers, so we choose university teachers and students as the research objects. This group has a certain scientific research foundation, continues to carry out scientific research work, and has rich experience in information retrieval, so it meets the needs of this experiment. In the interview work, it is planned to establish classified user groups, including three groups: university teachers, university graduate students, and university undergraduates, with 5 interviews in each group, totaling 15 people. Questionnaires are distributed to college teachers and students, and 200 questionnaires are planned to be distributed.

2.1.4. Experimental Flow Design. In order to get the mental model experiment to be carried out smoothly, it is necessary to make a detailed plan for the specific experimental steps, time, and place in advance, mainly writing the interview outline needed when communicating with interviewers. The interview outline is semistructured, mainly through the problem from shallow to deep, first, guide the interviewee into the state through simple questions, after understanding the retrieval habits of users, then encourage the respondents to review the latest information retrieval experience, let the user tell the whole retrieval process completely, and then interview the main line of information retrieval preparation, retrieval process, and retrieval effect evaluation according to the user's statement, so as to gradually dig out the user's cognition, retrieval demand, retrieval preference, retrieval habit, some interactive operations, and emotional changes of retrieval evaluation [10, 11]. The whole process of the interview is divided into five parts: the first part is warm-up, that is to introduce the subject, form, purpose, and data protection instructions of the interview to the interviewee first, it is mainly to let users enter the interview preparation state and understand what needs to be done next; then ask the interviewee basic information and other basic questions; the third part is to interview users with some related problems before retrieval, including retrieval needs, motivation, frequency, and software used, and then encourage users to recall the latest retrieval behavior and tell it out; the fourth part is according to the user's statement, continue to discuss the interactive operation and feelings that users will have in the retrieval process, and ask the pain points and cool points in the whole retrieval process; the fifth part is a summary of the whole interview content. The following is an outline of the whole interview.

(1) Basic information

Gender, age, educational background, and occupation.

(2) Basic ability of information retrieval

Do you often search for information? What is the frequency of information retrieval?
As a researcher, do you know the commonly used databases for academic information retrieval?

Which database is often used for information retrieval?

(3) Preparation before information retrieval

Under what circumstances will information retrieval be carried out?
What is the purpose of information retrieval?
Do you have basic information retrieval skills?
Before carrying out information retrieval, can you clearly realize your retrieval needs?
Before information retrieval, can the retrieval requirements be accurately described as search terms?

(4) Information retrieval process

When was the last information search?
Please describe the process of the latest information retrieval, including motivation, time, retrieval scene, equipment, database used, retrieval behavior, retrieval effect, and retrieval evaluation.

(5) Evaluation of information retrieval

Why do you choose one or several databases for information retrieval?
Information retrieval results meet the needs.
Score the satisfaction of information retrieval experience, with a full score of 10 points.
The effect of information retrieval results on scientific research.
Will there be any problems in the process of retrieval?
After encountering problems, how will they be solved? Such as asking others for help and looking for answers in the network.
Will the retrieval function be expanded for the database used? Such as using advanced retrieval and professional retrieval.
Is there any function that needs to be improved in the database that is used at present?
Will you explore other unfamiliar databases for retrieval?
When there is no clear scientific research demand, will you use the database to browse professional information?

2.1.5. Experimental Implementation. Before the experiment, we should make corresponding preparations, including preparing the outline of the interview, recording equipment (convenient for playback in later analysis), selecting the appropriate experimental place, in order to make the interviewees stay in a relaxed and quiet scene as much as possible, due to the epidemic situation, 6 of the 15 subjects in this experiment completed the interview in the laboratory or library, and 9 people conducted video interviews, each experiment took about 40 minutes [12, 13].

2.1.6. Experimental Conclusions. According to the interview outline, 15 users were interviewed in depth, the interview information was combed and descriptive statistics, and the representative conclusions were sorted out.

In the basic ability of information retrieval, most users think that they often carry out information retrieval. The frequency of information retrieval varies, and some users indicate that it will be carried out at any time according to the scientific research plan, more than 10 times a week. The information retrieval frequency of most users exceeds 5 times a week. Respondents said that as researchers, they know more about the commonly used databases of information retrieval and have their own databases. The Chinese databases are CNKI and Wanfang databases, while the foreign databases are Web of Science and Elsevier. In the preparation before information retrieval, most users indicated that they would carry out information retrieval in the scenarios of project declaration, writing papers, project research, and completing course assignments. The main purpose of information retrieval is to find relevant research documents and provide research basis for their own research. About half of the users think that they have mastered the basic information retrieval skills and implemented them in the retrieval process. Before information retrieval, most users think that they can clearly realize their retrieval needs. But in the transformation of retrieval requirements, about half of users said that they can describe the retrieval requirements as appropriate search terms and get the required retrieval results, while some users think that they have not clearly expressed them as appropriate search terms, so they need to search for many times. In the description of information retrieval process, most users reviewed the latest information retrieval scene; clearly expounded the retrieval motivation, time, retrieval scene, equipment, and database used; described the retrieval process; and evaluated the retrieval effect. In the aspect of information retrieval evaluation, more than half of users said that the retrieval results can meet their own retrieval needs and scored the satisfaction of retrieval experience above 8 points. Most users think that information retrieval results can play a positive role in scientific research [14]. In the process of retrieval, more than half of users have encountered corresponding problems. Some of these problems have been solved by turning to librarians, contacting database customer service or looking for answers in the network, and some users' problems have not been solved, so they are shelved. One-third of users indicated that they would take advantage of the expansion functions of the database, such as advanced retrieval, reference export, and sorting. For the database currently used, some users have proposed to improve the corresponding functions, such as batch download and synchronization between mobile phone and computer. In the absence of clear scientific research needs, only a few users will use the database to browse professional information [15, 16].

2.2. Quantitative Collection of Mental Information

2.2.1. Purpose of Research. In the first stage, the author conducted in-depth interviews with learners and collected a large number of mental information of users during information retrieval. In the second stage, on the one hand, in order to make the results more accurate and effective, the author compiles the information obtained from the interview into a questionnaire and uses the quantitative characteristics of the questionnaire to carry out a large-scale

Table 1: Mental model of information retrieval for scientific researchers.

Information retrieval motivation and preparation	Retrieval habits	Common databases Retrieval frequency Retrieve preferences
	Retrieval motivation	Retrieval scene Retrieval purpose Attitude towards information retrieval
	Retrieval preparation	Selection and understanding of database Retrieve requirement description Retrieval requirement transformation Selection of search words Selection of retrieval mode Retrieval result preset
Information retrieval ability and implementation	Competence	Proficiency in database Able to complete the retrieval process skillfully Applying certain information retrieval technology
	Retrieval implementation	Single retrieval time Retrieve policy changes View rate of retrieval results Retrieval result acquisition rate Screening of retrieval results Sorting of retrieval results
Information retrieval effect and evaluation	Retrieval effect	Expectation degree of retrieval Recall and precision Satisfaction degree of retrieval requirements Encounter result Willingness to continue information retrieval Differences between information retrieval and other users
	Satisfaction	Satisfaction of retrieval system Satisfaction of retrieval experience
	Extensive demand	Expanding requirements for retrieval results Expanding requirements for retrieval system Suggestions on retrieval system

delivery, thus verifying the effectiveness of the previous interview results. On the other hand, using the large-scale questionnaire, as well as easy to quantify the characteristics of the user's mental model information to collect again, so that the mental model is more complete [17].

2.2.2. Design of Questionnaire. The questionnaire design is based on the results of the first stage of user interviews. The content of the questionnaire is designed from five aspects: basic information, information behavior habits, basic ability of information retrieval, and current situation of information retrieval, expectation, and evaluation of information retrieval.

(1) Basic information

Including gender, age, educational background, and occupation.

(2) Behavior habit of information retrieval

Including information retrieval scene, retrieval frequency, single retrieval time, retrieval result viewing rate, and retrieval result acquisition rate.

(3) Information retrieval ability

Including the selection of information retrieval sources, the understanding of information retrieval database, the degree of information demand transformation, and the use of information retrieval technology.

(4) Present situation of information retrieval

Including the motivation of information retrieval, the attitude towards information retrieval, the advantages and disadvantages of information retrieval database, the willingness of information retrieval to continue, and the differences between information retrieval and other users.

(5) Expectation and evaluation of information retrieval

Including users' expectation of information retrieval, satisfaction of information retrieval experience, satisfaction rate of information retrieval to scientific research needs, and expansion needs of information retrieval.

2.2.3. Distribution of Questionnaires. The teachers and students of some universities in Jilin Province, Liaoning Province and Beijing City were selected as samples, and 200

TABLE 2: Typical user portraits.

	1	2	3
Gender equality	Women	Women and men	Men
Age	18-22	22-30	30-40
Retrieval motivation	Learning needs	Learning needs and scientific research needs	Scientific research needs
Frequency	Low frequency	Very high frequency	High frequency
Search database	Chinese	Chinese, foreign language	Chinese, foreign language
The single retrieval time	20 min	30-60 min	30-40 min
Retrieval methods	Basic retrieval	Basic retrieval, advanced retrieval	Basic retrieval, advanced retrieval
Expected results		Less than 1000 articles	Less than 500 articles
Adjust the retrieval strategy	Occasionally	Often	Often
Demand satisfaction	Basically satisfied	High satisfied	Basically satisfied
Persistent willingness	Low	High	High
Extended functions		Frequently screening, sorting, deriving references, document management	Frequently screening, index
The satisfaction of system	Generally satisfactory	Very satisfactory	Relatively satisfactory
User experience	Generally	Better	Better
Expectations	Easily accessible, sense of purpose	Easy retrieval, easy access, diversity, timeliness	Easy retrieval, easy access and conciseness
Meaning	Meaning	Very meaning	Meaning

questionnaires were distributed and 186 questionnaires were recovered [18, 19].

2.3. Construction of Mental Model of User Information Retrieval

2.3.1. Construction of Mental Model. Combining the basic experimental results of mental model and the quantitative collection of mental information, the mental data are analyzed to form clustering tasks, and the extracted tasks are classified into one class according to similarity and then aggregated into task towers, which are named, Similar "mission towers" are grouped into "mental spaces" and named separately. Finally, three mental spaces are formed, and the mental model of scientific research workers' information retrieval is constructed with the three-layer structure of task-task tower-mental space, as shown in Table 1.

2.3.2. User Portrait. By constructing the mental model of users, the author has a deeper understanding of the whole process of information retrieval for scientific research workers in colleges and universities. In order to have a clearer and macroscopic grasp of the target user groups and deeply understand their needs, the author constructs a typical user role model through cluster analysis according to the previous survey data (as shown in Table 2). User role does not refer to a specific person, but a collection of user behavior characteristics with the same attributes. Through abstract processing of a large amount of data, typical users of products are constructed, mainly including basic information, information retrieval habits, demand intensity, and pain points. Create fictional characters to help researchers understand more clearly the current cognitive status and core needs of users involved and provide better promotion strategies.

3. Strategies for Improving the Efficiency of User Information Retrieval

3.1. Understand the Retrieval System and Subdivide the Retrieval Purpose. Scientific research workers first need to information retrieval system, that is, we often say that the database has enough understanding, understand the basic information of the database, such as literature composition, basic retrieval function, expansion function, advantages and disadvantages of the database, requirements for retrieval and downloading of database resources, and define your commonly used Chinese and foreign databases as the main source of retrieval, and at the same time, understand some basic knowledge of standby databases as supplementary databases for retrieval. Before carrying out information retrieval, researchers should subdivide their retrieval purposes, including course study, thesis writing, project demonstration, patent application, and search criteria and formulate corresponding retrieval strategies according to the retrieval purposes [20].

3.2. Clarify Retrieval Needs and Improve Retrieval Skills. Researchers should clarify their own retrieval needs, and retrieval requirement is a kind of tacit knowledge and is in the brain of the searcher. This retrieval requirement may be clear or vague, but no matter what, it is necessary to

transform the retrieval requirement into search words that can be read by the system. In the retrieval system, the selection of search words is very important, which is related to the comprehensiveness and accuracy of the retrieval results, that is, the recall and precision that we are familiar with. In order to transform the retrieval demand into search terms, researchers need to master the necessary retrieval skills, including the selection of retrieval ways, retrieval methods, the use of Boolean logic retrieval, and the use of retrieval operators. The improvement of retrieval skills will help researchers complete the information retrieval work more smoothly.

3.3. Adjust the Retrieval Strategy to Accurately Hit the Results. In the process of information retrieval, one search may not complete the search task successfully. It is necessary for researchers to constantly adjust the retrieval strategy to ensure the smooth development of retrieval. In the process of adjusting the retrieval strategy, we can make full use of the expansive functions in the information retrieval system, such as screening, sorting, Boolean logic assembly, superposition of retrieval approaches, and export of retrieval results, so as to accurately hit the results and improve the retrieval efficiency.

3.4. Carry Out Retrieval Education to Improve Information Literacy. For most researchers, receive certain information retrieval training, is the necessary way to improve the efficiency of information retrieval, through the education of information retrieval courses, it can make searchers better master the basic knowledge of information retrieval system, basic skills of information retrieval, skills of improving information retrieval efficiency and related knowledge of information ethics, and improve information literacy and "search for business" from four aspects of information awareness, information thinking, information skills, and information ethics, thus improving scientific research efficiency.

4. Conclusion

Information retrieval is one of the essential work contents for scientific research workers to carry out scientific research work. How to improve the efficiency of information retrieval is a concern of many scientific research work. In this paper, mental model is applied to the study of information retrieval efficiency, through the basic experimental results of mental model and the quantitative collection of mental information, construct the mental model of information retrieval for scientific research workers, it also depicts the user portrait, which has certain reference value for understanding and improving the information retrieval efficiency of scientific research workers. However, this paper does not further explore the mental model system and does not apply necessary evaluation methods to calculate its weight and conduct empirical research, which needs further exploration in future research.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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