

**Letter**

# Analysis on Literature Resources Security System Based on Multidisciplinary Environment---Case Study of Shanghai Advanced Research Institute, CAS

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**Abstract:** Literature resources system play an increasingly important role in the research institute, and become the main source of information and intelligence in scientific research. The level of literature resources security is one of the key components affecting the research, management, and decision-making ability of an institute. At the same time, user's information literacy and information demand expectations are constantly changing and evolving. Taking Shanghai Advanced Research Institute, Chinese Academy of Sciences as an example, this paper starts with the analysis of research environment of institutions and the investigation of users' needs, draws lessons from Shannon's principle of information dissemination, establishes a literature resources security system model under multidisciplinary environment, and discusses the meanings and functions of the three elements of resources, services and users in the system. It also illustrates the significance of each elements as well as the process of information flow among these elements. The literature resources security system designed in this paper, based on the multidisciplinary context, can mostly cover all subjects in SARI through multi-channel and multi-type services, and creates an environment for SARI's multidisciplinary innovations. Meanwhile, the corresponding mechanism makes it possible to understand promptly demands in different fields and of different categories of users and provide customized services.

**Keywords:** Multidisciplinary Environment, Literature Resources Security, System Construction

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## 1. Introduction

Literature resources security means the capability of a country, a region or an institution to provide literature resources sufficient enough to satisfy demands for documentary information, with a view to shoring up the economic growth, social development and scientific studies [1]. For research institutes, the level of literature resources security marks the height of literature resource development and is one of factors that affect their research, management and decision-making abilities. In practice, building a literature resources security system is subject to impacts of multiple factors. This paper will discuss possible ways to build a literature resources security system under multidisciplinary environment, based on a case study of the Shanghai Advanced Research Institute, Chinese Academy of Sciences (hereinafter referred to as the "SARI").

## 2. Background Analysis

The SARI is committed to conducting original and innovative research, offering integrated technical solutions to strategic and emerging industries, and pursuing a development path by combining science and technology with economy, education, finance and culture. Distinct from the subject distribution of other institutes affiliated to the Chinese Academy of Sciences (hereinafter referred to as the "CAS"), the SARI has, since its founding in 2009, initially built and formed a multidisciplinary research picture featuring the coexistence of multiple domains, including cutting-edge and advanced manufacturing technologies, information and electronic technologies, energy and environment technologies, health science and technology. Meanwhile, the SARI actively endorses multidisciplinary studies and has subsidized several

new multidisciplinary research programs every year.

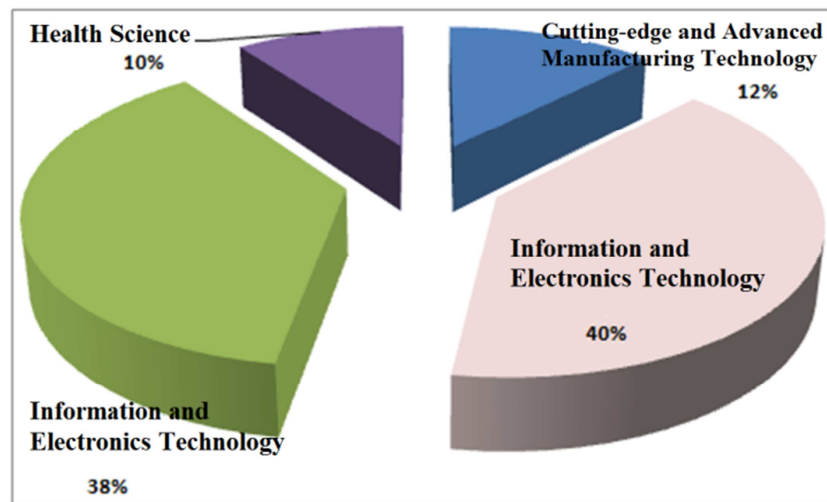
It can be seen that the SARI is an example of institutional exploration made by the CAS. Accordingly, efforts of the SARI in developing literature resources firmly focus on the institutional innovation. Faced with urgent demands of users pursuing multidisciplinary studies for resources of new and special types, the SARI devotes itself to providing relevant resources in a scientific and reasonable manner, aiming to realize the effective utilization of resources.

At the early stage after its founding, the SARI was operated short of research fellows, and its layout of scientific research and internal bodies for research departments were undergoing adjustments. After years of development, the SARI sees its subject distribution gradually shaped and research fellows stabilized. Specific research areas or direction and the human resources allocated thereto, are illustrated in Table 1 and Figure 1 as below, for the abovementioned four research

domains.

**Table 1.** Research Domains and Research Centers/Direction.

| Prospective Research Domains                         | Research Center/Direction         |
|--|-----------------------------------|
| Cutting-edge and Advanced Manufacturing Technologies | Macroscopic Quantum               |
|  | Advanced Equipment                |
| Information and Electronic Technologies              | Film Photovoltaics                |
|  | New Media                         |
|  | Urban Public Security             |
|  | Low-carbon Transformation         |
| Energy and Environment Technologies                  | Green Chemistry                   |
|  | Energy Storage                    |
|  | Greenhouse Gas                    |
|  | Carbon Data and Carbon Assessment |
|  | Systems Biology                   |
| Health Science                                       | Stem Cells and Nanomedicine       |
|  | High-end Medical Imaging          |



**Figure 1.** Human Resources Allocated to Four Research Domains.

Research studies conducted by the SARI involve a broad range of subjects, including computer, physics, mathematics, chemistry and biology. It is easy to note that these fields overlap with each other to some extent, which poses higher demands and bigger challenges to the development of literature resources.

### 3. Analysis of Demands of Literature Resource Users

#### 3.1. Availability of Existing Resources

Resources currently furnished by the SARI include free resources offered by the CAS and other resources paid by the SARI. As a supplement to free resources offered by the CAS, resources paid by the SARI are those bought by the SARI to satisfy the needs with respect to its distribution of subjects and multidisciplinary characteristics. So far, these paid resources cover over 20 multidisciplinary and monodisciplinary document databases, including Nature, Springer, Wiley and IEEE.

#### 3.2. Analysis of Resource Utilization

Under multidisciplinary environment, a monodisciplinary document database is unlikely to satisfy scientific and research needs in various areas. For the purpose of gaining a comprehensive understanding of the usage of different document databases in various areas, the author conducted an in-depth survey to look at the usage of those databases paid by the SARI.

Questionnaires were distributed among 144 key research fellows and 160 graduates, with 136 copies and 142 copies completed and collected respectively from each group. The author categorized the frequency at which a database exclusively developed for a subject is used, into different scales, including “every day”, “two or three times per week”, “once a week”, “two or three times per month”, “two or three times per six months”, “never used”. The survey result shows that, databases commonly used in various areas are integrated databases, including ScienceDirect, Science Online and Springer. The phenomenon that research in an area needs resources from the database specialized in another area match

the multidisciplinary positioning of the SARI. Details about the usage could be found in Table 2 as below.

**Table 2.** Usage of Various Databases in Different Areas.

| Database Name and Its Targeted Areas   | In the Area of Cutting-edge and Advanced Manufacturing | In the Area of Information Technology | In the Area of Energy | In the Area of Health Science |
|--|--|---------------------------------------|-----------------------|-------------------------------|
| ACM Digital Library:<br>a database specialized in <i>Computer Science</i>  | Rarely   | Commonly                              | Never                 | Rarely                        |
| ACS Journals<br>a database specialized in <i>Chemistry and Chemical Engineering; Environmental Science</i>   | Rarely   | Rarely                                | Commonly              | Rarely                        |
| AIP Journals<br>a database specialized in <i>Physics</i>   | Commonly   | Rarely                                | Never                 | Rarely                        |
| APS Journals<br>a database specialized in <i>Physics</i>   | Commonly   | Rarely                                | Never                 | Rarely                        |
| Annual Reviews<br>an integrated database covering <i>mathematics, physics, chemistry and chemical engineering, biology, medical science, and arts and social science</i>           | Rarely   | Rarely                                | Rarely                | Commonly                      |
| Cambridge Journals<br>an integrated database covering <i>mathematics, physics, biology, computer, geology, meteorology, agriculture, etc.</i>                                      | Rarely   | Rarely                                | Never                 | Rarely                        |
| Cell Press<br>a database specialized in <i>biology and medical science</i>   | Never  | Never                                 | Never                 | Commonly                      |
| Elsevier Science Direct<br>an integrated database covering <i>biology, agriculture, computer, astronomy, material science; physics, chemistry and chemical engineering</i>         | Rarely   | Commonly                              | Commonly              | Commonly                      |
| IEEE/IEE Electronic Library<br>a database specialized in <i>electronics, communication and information science, and automation</i>   | Commonly   | Commonly                              | Rarely                | Rarely                        |
| IOP Electronic Journals<br>a database specialized in <i>applied physics, computer science, condense-matter and material science, high-energy nuclear physics</i>                   | Commonly   | Rarely                                | Never                 | Rarely                        |
| ISI INSPEC<br>a database specialized in <i>biomedical engineering, biophysics, control engineering, electrical and electronics engineering, and material science</i>               | Rarely   | Rarely                                | Never                 | Commonly                      |
| Nature+NSJ a database specialized in <i>physics, chemistry and chemical engineering, geology, biology, medical science, and material science</i>                                   | Commonly   | Rarely                                | Rarely                | Commonly                      |
| Oxford University Press<br>a database specialized in <i>biology, medical science, chemistry, mathematics, physics, and engineering</i>   | Never  | Rarely                                | Never                 | Commonly                      |
| RSC<br>a database specialized in <i>chemistry and chemical engineering</i>   | Never  | Never                                 | Commonly              | Rarely                        |
| Science Online<br>an integrated database covering <i>mathematics, physics, chemistry and chemical engineering, astronomy, geography, geology, biology and agriculture</i>          | Commonly   | Commonly                              | Commonly              | Commonly                      |
| SPIE Digital Library<br>a database specialized in <i>physics</i>   | Rarely   | Commonly                              | Never                 | Never                         |
| Springer Link<br>an integrated database covering <i>chemistry and chemical engineering, astronomy, geography, geology, biology, agriculture and engineering technology</i>         | Commonly   | Rarely                                | Commonly              | Commonly                      |
| Wiley-Blackwell<br>a database specialized in <i>medical science, engineering technology, mathematics, physics, astronomy, material science, chemistry and chemical engineering</i> | Commonly   | Commonly                              | Rarely                | Rarely                        |

Note: “Commonly” means a database that is commonly used; “Rarely” means a database that is not used very often; and “Never” means a database that is almost not used.

The questionnaire survey revealed that more than 87 percent of key research fellows and graduates believe that existing databases are “enough” or “almost enough” to meet their demands. As to the way to be kept informed of currently

available databases, key research fellows welcome the receipt of “electronically sent materials” for this purpose, while graduates prefer “training sessions” as their first choice, followed by the option for receiving “electronically send materials”, to know more about existing databases. It was also showed in this survey that key research fellows have greater demands for the analysis of factual data, in other words, the retrieval analysis services, and 35 percent of surveyed research fellows expressed their interest in literature resources of other areas (multidisciplinary areas) in which they are not specialized, and that graduate respondents voiced the opinion that the biggest obstacle to their access of literature resources is their insufficient knowledge of how to use a database and employ search techniques, and also expressed the hope that relevant services could be offered by subject. Furthermore, more than 60 percent of key research fellows and 85 percent of graduates, in this survey, said they expect new and more diversified resources and services. A universal hope was noticed among respondents that there should be a platform for exchanging and sharing literature resource services and a corresponding channel for feedback.

Moreover, the SARI seeks supplements to its existing resources, by means of document delivery. Amid efforts in document information from 2011 till now, the SARI has offered document delivery services for 752 times, with an average of 188 times every year. Demands for periodicals, science newspapers, academic dissertations, conference papers, and books are satisfied in most cases, while demands for other types of documents, including standards, newspapers, and advisory reports, are not satisfactorily met.

### **3.3. Summary of Demands for Literature Resources and Purposes of This Research**

Subjects touched upon by the SARI are extensive, complicated and multidisciplinary. So far, the SARI has not built a concrete or physical library, and merely offer, in an electronic way, its resources and relevant services which, after years of development, have formed the foundation to some extent to secure needs for resources. In such a context, this paper discovers via the survey that scientific research practices and demands of SARI literature resource users show the following characteristics.

- i Literature resource users tend to be of young age and prefer electronic and digital operations.
- ii Sources, from which users specialized in different areas seek resources, and the user behaviors vary from each other. The types of document databases needed by users in the abovesaid four major areas, as well as the frequency of their use, differ from each other. Some users would like to search documents in multiple databases, while others believe that their demands for literature resources could be easily satisfied by only one database.
- iii The emergence of multidisciplinary areas results in variations in users' scientific research practices. Users are not simply satisfied with literature resources for their expertise, and thus demands for literature

resources for multidisciplinary areas grow larger.

- iv Unsatisfied with the currently available but not diversified types of resources and service mode, users are eager for new resources and services. Users engaged in the health science, for example, show their willingness to participate in subject-based customized training concerning patents and literature search, while users specialized in the energy area desire to have access to resources in diversified forms, such as experiment videos. Besides, it is widely believed among graduate users that building an exchange platform will be favorable to the effective communication among users about the methods on how to make use of literature resources, personal experience in this regard, and sources from which they seek resources.
- v Users raise “standardization” requirements for literature resource services. They advise the introduction of a feedback mechanism whereby problems arising out of the utilization of literature resources could be reported.

It can be seen from the survey that the current mode to guarantee literature resources is unable to fully satisfy demands of different groups of users, in the current conditions and context. In comprehensive consideration of different factors, there is need to adjust and optimize the current security of resources, enrich extended resources and services, and form a standardized service mechanism. Thus, this paper, with the focus on distinct characteristics of subjects, designs and creates a model for the literature resources security system under multidisciplinary environment, with a view to creating a thorough solution for resource security.

## **4. Design of a Literature Resources Security System under Multidisciplinary Environment**

The literature resources security system under multidisciplinary environment, as proposed in this paper, is designed to not only satisfy universal demands and secure the availability of basic resources to the largest extent, under multidisciplinary environment, but also deliver supporting resources and services featuring subject characteristics and adaptive to user behaviors, via platforms of different nature, by fully considering unique demands of different subjects and taking advantage of information approaches.

In the communication science sense, the process of information transmission, in short, starts from “information sources”, followed by “information channels”, and ends with “information sink”. An “information source” refers to a person that publishes information, namely an uploader. “Information sink” refers to a person that receives information, namely an end user [2]. And an “information channel” means the medium connecting an information source and an information receiver. This information transmission mode, as a methodology coined by Shannon, may be applied to a wide range of systems, including the communication system, the management system and the social system. This model, after

transformed by scholars specialized in the communication science, turns into one of basic models to illustrate the transmission of information among human beings, and also the most fundamental research model in the communication area. In the area of library and information science, service resources under the subject service structure play as the information source, while subject librarian users and the space to access service resources, under the said service structure, constitute the information sink, and service resource flow routes, under the service structure, become the information channel [3]. Such three components form the information flow process.

A literature resources security system under multidisciplinary environment, as displayed in Figure 2 as below, is created based on the aforesaid survey conducted for this paper and by reference to the Shannon's information system model.

The successful functioning of the system under this model cannot be achieved without the mutual support of different

elements and the flow of information between different elements.

#### 4.1. Element Analysis

The literature resource security model under multidisciplinary environment comprises three major elements, namely resources, services and targets.

##### 4.1.1. Resources

Resources, as the information source, are the foundation of the entire security system. Resources, in the literature resource security model under multidisciplinary environment, are divided into basic resources and supporting resources.

##### i Basic resources

Basic resources are mainly resources available in document databases of the SARI, including document databases provided by the CAS's National Science Library and other databases paid by the SARI.

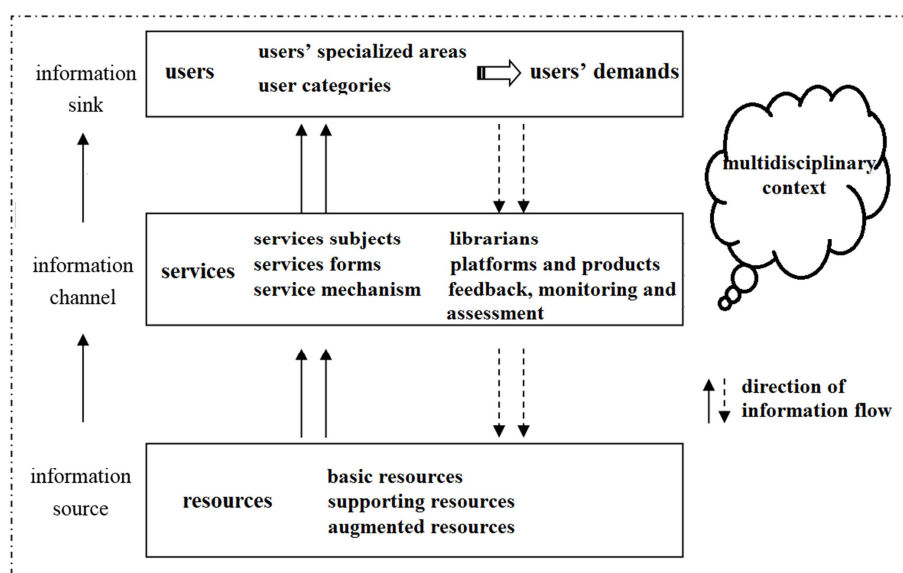


Figure 2. Model of the Literature Resources Security System under Multidisciplinary Environment.

Through an extensive survey of demands and an in-depth analysis of use frequencies, and on the basis of data provided in Table 1 hereof, this paper classifies database resources paid by the SARI into three categories illustrated in Figure 3 as below, because the classification of different databases

depending on their respective usage in different areas, is helpful in understanding the utilization of databases in different areas and working out a reasonable plan for what databases should be purchased next year.

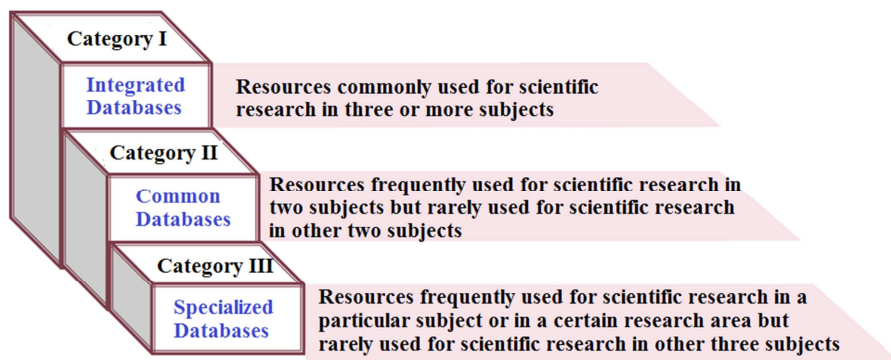


Figure 3. SARI-paid Database Resources under Multidisciplinary Environment.

Integrated databases, labelled as Category I, mean resources commonly used for scientific research in three or more subjects, and must be guaranteed due to their high use frequency, including Science Online (covering four subjects), Springer (covering three subjects) and Science Direct (covering three subjects).

Common databases, identified as Category II, refer to resources that are frequently used for scientific studies in two subjects but seldomly used for scientific research for another two subjects, including Nature, Wiley, IEEE and OUP.

A specialized database, classified as Category III, means resources that is frequently used for scientific research for a particular subject or a certain research area but not used too much for other three subjects. A Category III database tends to be specialized in a unique area, with low use frequency among the general but high popularity among a centralized group of users. For example, ACS and Annual Reviews are databases frequently used for a particular subject but rarely used for other subjects; ACM, AIP, APS, IOP, Inspec, RSC, SPIE and Cell Press are databases frequently used for a particular subject but rarely or even never used for other subjects; and Cambridge Journals is a database rarely used for three subjects and even not used for one subject.

It could be seen from the categorization and the quantity of documents downloaded in full text that integrated and common databases tend to be utilized at a higher rate of over 80 percent, while specialized databases are consulted at a relatively low rate due to the specialized expertise threshold, merely by a centralized group of users engaged in scientific research. Therefore, in order to guarantee databases needed in the future, both complete databases (for integrated and common databases) and periodicals (for specialized databases) will be paid and purchased.

#### ii Supporting resources

In general, it is a common practice among research institutes to satisfy around 80% to 90% document demands in scientific research through basic literature resources and the remaining 10% to 20% document demands in scientific research through supporting resources, in consideration of the most optimal cost-effectiveness. Supporting resources include delivered documents, open access resources and extended resources. First, document delivery is an effective approach to supplement resources available in existing document databases. However, the statistical survey reveals that not all requests for delivered documents are met. Thus, it is of necessity to consider seeking documents from other sources to further diversify resource types. Second, open access is gradually gaining popularity among multi-literature fields and subjects, which, to a large extent, will transform the mode of exchange of academic documents and information, and the structure of information resources and the layout of information transmission [4]. The enhancement of open access resources for subjects in which users are interested will be helpful in promoting the sharing and transmission of academic information among users specialized in different fields [5], lowering costs to purchase literature resources and

integrating a wider range of literature resources. Third, extended resources will be enriched and diversified. The survey demonstrates that a majority of research fellows and graduates expect to have access to more resources of new types, such as experiment videos. Therefore, there is need to regularly add to extended resources and optimize the structure of basic resources and supporting resources, in order to satisfy ever-changing demands of users.

#### 4.1.2. Services

Information cannot be transmitted without transmission channels. Under multidisciplinary environment, services, in the role of the information channel, deliver resources to users, and involve three components, namely service subjects, forms of services and service mechanism.

##### i Service subjects

Service subjects include documentation personnel and subject librarians. Documentation personnel and subject librarians, playing the leading and dominant role under the model proposed in this paper, are responsible for receiving, assessing and organizing resources and services effectively for various subjects and assisting users in, in a flexible and convenient way, accessing resources, processing information, extracting information and seeking exchange and collaboration.

##### ii Forms of services

There are two forms of services, i.e. service platforms and service products. Scientific research institutes without concrete or physical libraries undoubtedly need a virtual platform where they could display, integrate, share and disseminate resources. Platforms of distinct functions and characteristics are designed to satisfy demands from scientific research in different areas, and demands of decentralized users for accessing resources. These platforms could be portals, Institutional Repository and exchange communities for scientific research. First, portals, as an expansion of document information functions, are essentially aimed at providing orderly digital information services [6]. Ideally, users are enabled to find answers to any problems related to the document information supplied by the SARI. Information regarding such resources and services, including document databases, document delivery, open access resources, lectures and training sessions will be presented on such a portal. Second, Institutional Repository ought to satisfy both the institutional demands and demands of users, in order to not only enable scientific research fellows to enjoy helpful services [7], but also make it possible to automatically gather together knowledge produced by this institution which, for the SARI, means the systematic collection and long-term storage of SARI's research fruits, including journal articles, conference papers, monographs, dissertations, research reports, presentation reports and multimedia materials. As a result, a centralized and unified digital asset management system could be shaped to avoid disadvantages and risks of saving information in a decentralized manner [8]. Third, an exchange community for scientific research is a virtual place

for SARI's scientific research fellows to exchange ideas and seek multidisciplinary collaboration. Such a community could combine scientific research groups, digital libraries and knowledge exchange space into a compound system. With the focus on scientific research and featuring multidisciplinary characteristics, the community enables scientific research fellows to freely form discussion groups based on projects or their personal interest in scientific research. And members in different discussion groups may learn from each other's experience and share information. Furthermore, resources of a specific subject will be regularly pushed to relevant discussion groups [9].

Products are categorized into three major groups. Basic resource and service products are intended for publicizing and promoting resources and offering services in the form of training sessions and lectures, depending on the constitution of existing resources and user demands. Scientific research service products are mainly analysis services based on factual data, such as subject-based analysis services, including the statistical analysis of papers concerning science and technology, statistical analysis of patents, analysis of selective dissemination of information, and bibliometric analysis for a particular field. In light of facts that user demands and behaviors are not invariable and institutions which users belong to also see constant evolvement and adjustments, there is need to expand the range of service products by rolling out customized and individualized service products.

#### iii Service mechanisms

Developing service mechanisms is an indispensable component of the above model to ensure the effective and orderly flow of information [10]. Such service mechanisms include the feedback mechanism, the monitoring mechanism, the evaluation mechanism and the sharing mechanism. First, a feedback mechanism is intended for fully understanding user demands and gaining a timely picture of users' utilization of resources and services, and could demonstrate what resources are chosen by users, how they make use of resources and what issues they use the resources to address. In this regard, users act as the information source to some extent. Nevertheless, whether intended purposes could be achieved under the feedback mechanism which is merely a means, depends on the application of information feedback [11]. Second, monitoring needs to be conducted at two levels, internally and externally. Internal monitoring targets user behaviors and their utilization of resources and services. Apart from information collected under the feedback mechanism, a statistical analysis of factual data, such as the resource usage and the citation contained in published papers, may also be favorable to monitoring the utilization of resources and user behaviors. The external monitoring shall be conducted, in line with the scientific and technological layout of the SARI, to look into new types of resources, citation of counterparts, and resources available in core fields. Third, information collected under the feedback mechanism and the monitoring mechanism should be evaluated regularly, in consideration of environmental factors, and the evaluation result will be used as the reference for the purchase of databases, the development of platforms and the

provision of services. Fourth, due to a wide range of subjects covered by the SARI, its diversified resources and decentralized users, it is of necessity to establish a platform-based sharing mechanism. Database resources, open access resources, and extended resources could be integrated and shared on the portal; Output of scientific research, such as papers, grey literature, documentary formed during scientific research, and knowledge output of subject groups, could be gather together into the Institutional Repository. The SARI inspires the generation of new ideas between the multidisciplinary area and other domains, and has fruits of multidisciplinary brain storm aggregated and shared in the exchange community for scientific research.

#### 4.1.3. Users

Information arrives at the ultimate sink through the information channel [12]. Under the above model, research fellows and students are final information receivers. The survey result shows that the perception of research fellows differs, to some degree, from students (mainly graduates). User cognition, as a concept originating from the psychology, stresses the process through which a user acquires new information and knowledge with the aid of the information this user has accessed [13]. The survey and analysis of user behaviors on the sharing platform will enable us to further understand ways in which users obtain information and their habits of using resources.

Under the above model, documentation personnel and subject librarians will, depending on user demands, offer services of different types and display the same on the platform, and users will seek various resources and services from the platform, according to personal needs. In the meanwhile, changes in scientific research habits and information behaviors of users could be reflected via the feedback mechanism.

### 4.2. Analysis of Information Flow

A system may play its role only when information flows in an effective and orderly fashion [14]. Under the above literature resource security model under multidisciplinary environment, information flows vertically and horizontally.

#### 4.2.1. Vertical Flow

Under the above model, vertical information flow is the two-way flow, both from the bottom up and from the top down.

##### i Information flow from the bottom up

Service subjects screen out various resources according to their contents and optimize the design of resources' structure, before displaying and sharing these resources on different platforms. Users are enabled to receive services on different platforms, depending on characteristics of each subject or their demands in scientific research. Alternatively, service subjects could directly provide users with customized products developed on the basis of their personal demands.

##### ii Information flow from the top down

On one hand, users will submit new demands to service



subjects through the feedback mechanism, along with progress in scientific research activities and as a result of multidisciplinary requirements. On the other, service subjects will regularly adjust and optimize existing resources and their service mode, via monitoring and evaluating the users' utilization of resources, user behaviors and external new resources.

#### 4.2.2. Horizontal Flow

Horizontal flow means the mutual flow between different information sources, information channels, or information sinks.

- (1) Within an information source, resources vary along with changes in user demands and environment. Basic resources may be regularly adjusted between three major categories as illustrated in Figure 3, according to the usage of databases and actual demands. Databases of Category II are those extensively needed, frequently used and thus generally familiar to most users. These fundamental databases must be guaranteed. However, databases of Category II are helpful for users in certain subjects and should be regularly monitored to look at the usage among users. Such databases may be adjusted to be included into Category I or Category III, if the usage exceeds or drops to, a specific criterion. In terms of databases of Category III that are used the least by a small group of users, it is of necessity to adopt both the feedback mechanism and the monitoring mechanism and establish the evaluation criteria. If such a database is not cost-effective enough, it is reasonable to think about whether to exclude it from the basic resources and satisfying the relevant demands through supporting resources (such as delivered documents). Should new resources be discovered, they may be added as a supplement to the Category III, once evaluated.

Like basic resources, supporting resources and extended resources should be adjusted and supplemented, according to the monitoring, feedback and evaluation results.

- (2) Within an information channel, service subjects, playing the dominant or leading role, are enabled, under the feedback, monitoring and evaluation mechanisms, to obtain and adjust new and existing resources, optimize categories and contents of products, integrate and optimize products according to characteristics of resources and services, and share and present them on different platforms.

Regular announcements will be released on the portal to brief on supplements to and the trial of database resources, supplements to open access resources, schedule of recent lectures and training sessions, updates of scientific research services and products. Service subjects will regularly upload scientific research fruits achieved by the institute where they work, into this Institutional Repository. In an exchange community for scientific research, the number of participants in group discussions and the areas under discussion, will vary

along with the changing multidisciplinary demands and influences of this community, and the resource dynamics in group discussions is closely associated with group members' continuous exchange and sharing of knowledge. Literature personnel and librarians, as community managers, will promptly monitor information resources and collect and process information, according to customized demands of such groups, and offer knowledge pushing services in certain forms. Meanwhile, service subjects will maintain and update three major platforms, according to feedback of users and content of services.

Along with the development and operation of the above model, the abovesaid four mechanisms need to be dynamically improved at the same time, to cater for ever-changing demands of users in scientific research.

- (3) Within the information sink, the cross-discipline subjects give rise to new user groups, and the exchange and dissemination of scientific research practices and usual ways to seek resources will create new demands. In this scenario, asymmetric information likely caused by the rise of new demands and research behaviors out of the cross-discipline and the failure of literature personnel and librarians to promptly understand such new demands [15]. Therefore, service subjects need to rapidly learn about and understand demands of multidisciplinary research fellows, offer customized knowledge services, and secure effective and orderly innovation and communication of multidisciplinary users.

## 5. Conclusion

For the purpose of building a literature resources security system under multidisciplinary environment, efforts should be oriented toward subject development, stay focused on the satisfaction of user demands, aim at resources, services and platforms, pursue the width, frequency and depth of user demands, collect feedback in a timely fashion, conduct regular monitoring, make adjustments in due time, and form a reasonable layout. The literature resources security system designed in this paper, based on the multidisciplinary context and in full consideration of subject characteristics and users' scientific research practices and demands, is advantageous in the following respects. First, the guaranteed basic resources could almost cover all subjects in which the SARI is specialized and could be dynamically adjusted according to actual needs. Second, aforesaid four mechanisms could satisfy users' standardized demands. Third, compared with the previous single type of resources and service mode, this model offers new types of resources, provides various ways to access resources, and delivers customized services. Fourth, this model creates an environment for SARI's multidisciplinary innovations, in which a scientific research user in the community is enabled to rapidly find research fellows specialized in a particular area, understand their research areas and form multidisciplinary research groups. In the meanwhile, the feedback mechanism and the monitoring mechanism make



it possible to understand promptly demands in different fields and of different categories of users and provide customized services.

Furthermore, the following issues should be considered over the course of building a literature resources security system under multidisciplinary environment, including “comprehensively considering the range of subjects covered by an institute”, “evaluating the content of resources, the quality of resources, and similar resources purchased”, “fully satisfying multidisciplinary demands and providing the platform for the integration, sharing and exchange of resources” and “integrating multiple ways to access resources and organizing diverse service modes, in consideration of behaviors of users specialized in different areas”.

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## Biography



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