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Integrated platform of science and technology service resources under big data environment

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***Abstract*—Under big data environment, the number of scientific and technological service resources has exploded, and users who need those services have an increasing demand in terms of service quantity and quality. In fact, the traditional methods of integration and query of service resources do not meet the needs of fast and complete services, also do not meet the needs of new technologies, such as big data at the technical level. Based on the big data environment, this paper analyzes the changes in the service functions of integrated technology service resources, studies the "smart" technology integration sharing platform, breaks the limitations of physical space, realizes the integration of technology service resources in different regions, and explores new integrated technology services. The way of resource integration enhances the spillover effect of scientific and technological resources, releases the potential value of resources, ensures the adequacy of scientific and technological service resources, improves scientific literacy and innovation capabilities, and promotes the development of science and technology.**

***Keywords*—big data, science and technology service, platform, micro service, innovation, service resources**

I. Introduction

Due to the past technology, management and other reasons, different departments have established many science and technology service platforms according to the characteristics of the departments. There is a lack of unified planning for the construction. The platform is relatively independent and scattered, showing fragmentation problems. The process and standard of platform application are not unified, and the science and technology service resources are overlapped. The problems not only cause the waste of valuable scientific and technological resources, but also lead to barriers in the use of users, difficulties in using service resources, increasing the cost of using service resources, and affecting the promotion of innovation. Especially in the era of big data, the total amount of data increases explosively, including massive data with different structures. How to modify the integration mode of scientific and technological resources, establish a unified and perfect comprehensive science and technology service resource sharing platform, adapt to the needs of new technologies and release the potential value of resources, has become the concern of governments, enterprises and researchers at all levels.

II. Related Research

Science and technology service resources can provide necessary material and policy guarantees for innovation activities, promote scientific and technological innovation, assist decision-making at the scientific and technological level, and promote scientific research. They are important strategic resources for the country and various regions. Reference [1] defines science and technology service resources as including equipment needed for scientific research, science-related papers, data, and research results, etc.; [2] refines the definition of science and technology service resources and puts forward the "five elements theory", which are science and technology human resources, financial resources, equipment, information, policy and management resources. As shown in Fig. 1, human resources include researchers who directly conduct scientific research, as well as indirect staff who provide services for scientific research activities and ensure the normal progress of scientific research. Scientific research human resources occupy a dominant position in all service resources; financial resources including the financial support needed in the process of scientific research, the main sources are self-financing of enterprises or research institutions, government financial appropriations, and bank loans; scientific and technological equipment resources mainly include various large-scale instruments and equipment used in the scientific research process. Kinds of reagents, as well as national key laboratories, experimental bases, scientific research service institutions and other infrastructure; scientific and technological information includes various papers, documents, related patents, data, etc.; scientific and technological policies and management resources include national-level development strategies and governments at all levels scientific research policies and relevant scientific research management units at all levels.

However, the existing technology service resource platforms have the following shortcomings: there are many types of technology service resources, the corresponding platforms are scattered, services are fragmented, the scope of services is limited, and there are service gaps; information standardization among various resource platforms is low , lack of uniform resource description standards and intelligence in retrieval and query, lagging management methods, and high cost of use; resource platforms are separated from each other, lack of sharing mechanisms, and customer experience is poor; platform use technology does not meet high concurrency and stability. It is difficult for users to use it due to the lack of effective interaction between users and the platform. Due to lack of "intelligence", meeting the growing needs of users for personalized and professional resource services is difficult.

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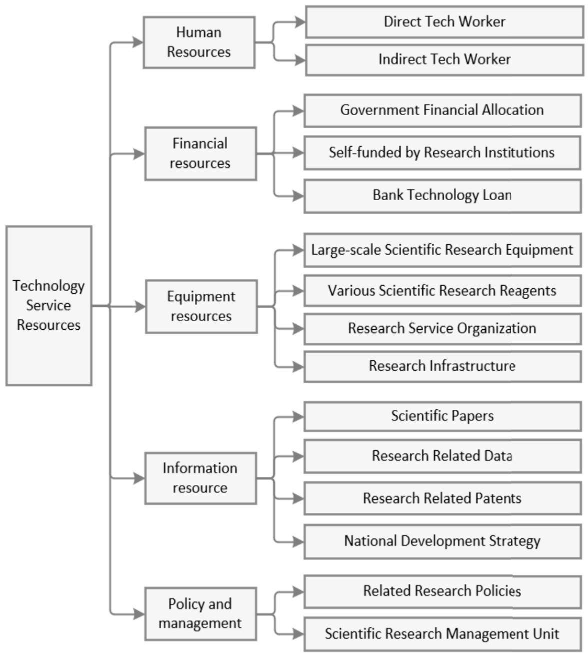

Fig. 1. Contents of science and technology service resources

In response to these problems, the researchers have made corresponding explorations. Reference [3] analyzes the types and corresponding characteristics of the integrated technology service resource integration platform. Reference [2][4] separately researches the classification system of science and technology resources and the optimization method of science and technology resource services. Reference [5] carried out the development process of large-scale scientific research instruments in south of China on the issue of how to integrate different types of resources, [6] discussed the design of the platform from the perspective of the actual needs of users; and in the specific platform architecture and implementation technical lev [7] introduced. Based on the distributed architecture system, [8] proposed to build a cloud platform model based on cloud computing virtual technology for the problems of different users in different geographical areas.

In the context of the Internet of Everything, the total amount of data doubles every 18 months or so [9]. The newly added massive amount of data has the characteristics of large volume, many types, fast increase speed [10], more information[11] and authenticity [12]. On the one hand, big data has brought new opportunities to the development of technology service resource integration platforms. The rapid addition of scientific and technological service resources provides a new paradigm of thinking for innovation. The expansion of resources and convenient acquisition methods provide a broad soil for scientific and technological innovation. The threshold for obtaining professional knowledge is lowered and the speed of information processing is improved. Promote the production of scientific and technological achievements. On the other hand, big data also brings challenges and has a certain impact on the platforms and service models that provide scientific and technological service resources. Reference [13] believes that big data has increased demand for platform information search capabilities and information security protection; [14] proposes that big data upgrades the platform's service methods and information organization mode; [15] explores the role of big data in promoting platform technology and the improvement of the structure and organization system. In terms of service mode, [16] believes that the ability to process real-time big data can affect the efficiency of information retrieval and user satisfaction with services; [17] proposes that in the face of rapidly increasing massive amounts of big data, traditional technology service models have not meet actual needs; [18] analyzes from the perspective of user demand changes and believes that in a big data environment, user needs for personalized and customized technology services will increase rapidly. However, the existing research lacks the analysis of the basic principles of the technology service resource integration platform under the background of big data, and the specific research on platform services and structural changes.

III. Big Data

In the environment of big data, the resource integration platform faces not only massive data, but also a variety of types, especially unstructured data, which brings challenges to the platform's data storage capabilities and external service capabilities. Faced with the core problems of users' increasing individualization, complexity and new needs, and facing potential and future needs, explore how to design a reasonable "smart" technology service resource integration platform.

A. Analysis of the basic functions of the platform

The integrated science and technology service resource integration platform is an important part of the national innovation system. Under the environment of big data, the platform is required to be large enough so that it can integrate massive amounts of data and be able to provide different services to the outside world. Limited to local services and a single service dimension. Aiming at the problem of insufficient support capability of technological innovation under the new technology, the technological basic condition platform is analyzed, and the "smart" technological service resource integration sharing platform needs to meet the following basic functions:

- Comprehensive science and technology service resources; The integration platform of science and technology service resources gathers and configures various scattered science and technology service resources, realizes the heterogeneous storage and unified scheduling and management of different types of resources, and expands the breadth and depth of data. The cornerstone of integrated platform construction;
- Integration of service resources; on the basis of resource aggregation, the planned decomposition and reorganization of heterogeneous resources, the establishment of a unified resource description and retrieval method, the establishment of links between various resources, and the realization of different types of scientific and technological services Integrated sharing of resources;
- The main body of supply and demand docking; on the one hand, through the use of micro-service architecture and other methods, to meet the increasing complexity and individual needs of users, and

improve the utilization of resources; on the other hand, users who demand scientific and technological resources may become suppliers. Provide scientific and technological wisdom, scientific and technological patents, etc., and provide docking guidance for role conversion through the service platform;

- The scalability and security of the service resource platform; with the advancement of science and technology, there are more and more demands for scientific and technological services, and the demands are gradually becoming more complex and personalized. The platform must face the future and provide new services leaving room for expansion, security puts forward requirements for data storage, failure recovery, and network attacks.

Based on the purpose of the technology service resource integration platform to serve users and the future-oriented strategic positioning of the resource service platform, the needs of the technology service resource integration platform are macroscopically divided into three categories, which are based on actual demand and after a period of development. The potential needs of users, the future needs that try to infer [19]. The actual demand based on reality refers to the demand for scientific and technological resources proposed by users on the platform according to the actual demand. This demand is clear and can be accurately obtained; while the potential demand refers to the in-depth exploration of the user's actual demand, combined with the user. The portraits of different types of service resources are used for statistical and comprehensive analysis, and the results of the hidden demand mining. This kind of demand is relatively a kind of prediction, but the platform needs to meet the needs of users. Timely and targeted adjustment and optimization; future demand is based on various data and various national policies and strategies, combined with the development areas of different industries, and a judgment on future technological needs is relatively vague. Demand, but it is the development form of the future platform. The analysis of the overall framework helps the platform to have a macro-control over the purpose of the different stages of the platform and the functions that need to be realized in the process of platform construction.

The integrated platform realizes the transformation of the technology service model, from the original "point-to-point" service model in which users apply for service resources on the decentralized departmental platform to the new "point-to-face" model. The required scientific and technological resources can be applied for once, and the required packaged complete scientific and technological service resources can be obtained. The transformation of service mode promotes the precise supply of scientific and technological services and improves the utilization rate of scientific and technological services.

B. Accurate identification and mining of needs under big data

The precise identification of technological service needs mainly includes the feature extraction of technological service demand and the classification of technological service resource demand types. In terms of the characteristics of technological service demand, due to the promotion of big data, the difficulty of acquiring knowledge is reduced, the competition for innovation is becoming increasingly fierce, and users' demand for technological resources is time-sensitive; and there are fewer channels for acquiring technological services, and related demand services are difficult to replace. Rigidity and the threshold for technological innovation has increased. In addition to scientific and technological literature, related instruments and equipment are also required, and the demand for resources is complex. In terms of the types of scientific and technological service resource needs, there are different classification methods based on different dimensions, for example, according to the occupational classification of resource demand users, the user's personal scientific research needs, scientific research institutes and even universities; industries according to scientific and technological needs Classification, including new energy, new materials, intelligent manufacturing, and so on.

Accurate identification of the needs of scientific and technological services is an important feature of the "smart" integrated sharing platform. After identifying the needs of different users, a unified standard format description of the actual needs of scientific research services is required to clarify the actual scientific and technological service resources used, accurate refinement. At the same time, in the above process, the user's portrait needs to be transformed and stored in detail in a unified format, and the user's scientific research experience, the purpose of using resources, and the existing research results must be investigated and summarized in detail. It is conducive to the targeted adjustment and optimization of the integrated platform according to the actual situation during the use of the integrated platform to better meet the needs of users.

C. The impact of big data on the overall service model of the platform

In the environment of big data, the needs of users have gradually changed from the traditional "whatever the platform can provide" to the demand for the platform according to their actual needs. The user completes the transition from passive acceptance to active proposal. Therefore, the platform also needs to address sexual changes, based on the actual needs of users, conduct in-depth analysis and identification, accurately mine potential needs, describe user needs in a standardized way, summarize and summarize the needs of different users, and propose future possibilities Speculate on the demand. As shown in Fig. 2, it shows the changing trend of the service model during the evolution of the platform. The details are as follows:

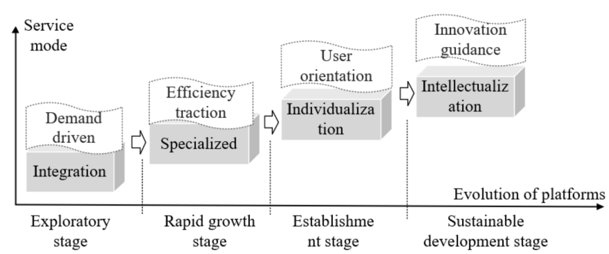

Fig. 2. Evolution process of service resource integration platform

(1) Service integration driven by demand

In the "smart" platform exploration stage, users are still at the level of "passively" receiving scientific and technological service resources, and scientific and technological service resources include a wide variety of resources, including resources such as instruments and documents that can be easily quantified, as well as scientific and technological guidance and technical research. And other resources that are difficult to quantify. In the era of big data, different heterogeneous the resource differences and unique advantages of resources will be amplified and difficult to replace. Therefore, it is necessary to format and store these heterogeneous resources, and continue to collect relevant data to improve the continuity of service data.

(2) Service specialization based on efficiency traction

Users have different educational backgrounds and industry backgrounds, and there are certain differences between different industries. The user's demand for scientific and technological services has shown "coarse" to "fine", "Broad" to "Fine" characteristics. Therefore, it is necessary to establish targeted professional services, improve the types of scientific and technological resources and information in different fields of the platform in various industries, and meet the needs of users for specialized resources.

(3) Service personalization based on user orientation

The individualized needs gradually become prominent, what include two aspects. From the analysis of users' individualized needs, with the increase of users, different users have different requirements for scientific and technological service resources. And the way of obtaining resources also changes with changes in technology. While mobile, digital and other methods are convenient for users, it also requires that the services provided by the platform can be changed according to the individual needs of users; on the other hand, from the perspective of service integration platforms Analysis shows that the platform can provide more accurate services with personalized features based on the user's portrait.

(4) Service intelligence based on innovation guidance

In the stage of continuous development of the "smart" platform, innovation capabilities continue to increase, the difficulty of data collection is reduced, and the dimensions of data obtained are more. The platform can analyze these user data using intelligent methods, using machine learning and data analysis. And other advanced information technologies, establish user portraits that use resources, and accurately identify hidden needs; at the same time, the platform intelligently analyzes the integrated resources, and uses visualization and other means to gather various integrated service application scenarios. Organize and mine the data, turn various hidden resources into explicit resources, and realize the value-added of resources.

Through analysis of the impact of big data on the service mode of the science and technology service resource integration platform, the architecture system is effectively changed in response to the changes in the service mode of the science and technology resource integration platform construction to better meet the actual needs of users.

IV. MICROSERVICES

Because microservices can realize service splitting and reconstruction, [20] introduced microservice architecture in the construction of a new type of community education resource sharing platform and commercial online education system, automatic load balancing configuration.

A. The advantages of microservices

The containers of the microservice architecture are isolated from each other through software, and each container has an independent environment. Therefore, the development, maintenance, and launch of the container do not affect each other. Combined with the system fuse mechanism, the high availability of the system is achieved and the user's downtime is reduced. The use of microservice technology to build an integration platform also needs to follow several basic construction principles to ensure that the microservice architecture meets the actual needs of the platform. The specific principles are as follows:

1) The principle of functional uniqueness. When refining specific functions, it is necessary to accurately divide the specific function boundaries of each microservice. In this way, ensure that the functions of the microservice are clear;

2) The principle of service independence. Each microservice has an independent operating environment in all aspects of development, deployment and operation, which improves the interdependence of microservices and reduces the coupling between microservices;

3) The principle of light-weight communication. Each service of microservices can meet normal user needs and run independently, and there are relatively few communication requirements between microservices.

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B. Integrated platform architecture based on microservices

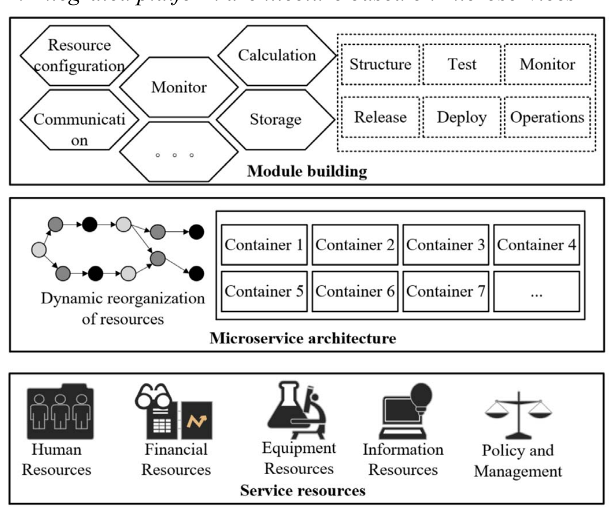

Fig. 3. Integrated platform architecture based on microservices

The specific microservice-based technology service resource integration platform architecture system is shown in Fig. 3. First, through the collection and dynamic reorganization of technology service human resources, financial resources, equipment, information, and policy and management resources. Second, the microservices are split and the microservices are used. The container technology in the service, and then build different modules such as resource configuration, communication, calculation, to realize the underlying architecture of the system.

V. CONCLUSION

Through mining and impact analysis on the needs of users in the big data era, on the basis of absorbing and summarizing the relevant big data, technology service integration sharing platform, this paper systematically designs a "smart" integration based on the microservice architecture. The science and technology service resource integration platform increase the service efficiency and service accuracy of the platform, improves the utilization rate of science and technology services, meets the needs of users for innovation, and realizes the continuous development of the technology service resource integration platform.

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