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Activation of Ontact Research Using Science & Technology Knowledge Infrastructure ScienceON

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ABSTRACT

As data-based research activities and outcomes increase and ontact or non-face-to-face activities become common, the demand for easy utilization of resources, tools, functions, and easily accessible information required for research in the R&D sector has increased accordingly. With the rapid increase in the demand for collaborative research based on online platforms, research support institutions strive to provide venues for research activities that merge various information and functions. ScienceON, an integrated science & technology (S&T) knowledge infrastructure service developed and operated by the Korea Institute of S&T Information (KISTI), supports open collaboration by connecting and merging all the information, functions, and infrastructure required for research activities. This paper describes the online research activity support tool provided by ScienceON and the remarkable results achieved through this activity. Specifically, the excellent creation of the following flow of meta-material research activities in the ontact space is elucidated. First, the papers required for a meta-material analysis are retrieved, virtual simulation is conducted with the experimental data extracted from the papers, and research data are accumulated. ScienceON's tools for supporting ontact research activity will play a role as an important service in the era of digital transformation and open science.

Keywords: ScienceON, science and technology infrastructure, convergence, ontact R&D, open collaboration

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1. INTRODUCTION

The non-face-to-face lifestyle and the spread of digital technology owing to the COVID-19 outbreak are leading to several changes in the way research is conducted, communicated, and collaborated during research activities. In such an environment, efforts are being made to promote collaborative research based on data available on online platforms, as well as to facilitate the migration from digital transformation to full-digital transformation. The corporate sector strives to seek new growth with new business opportunities and to preemptively respond to environmental changes triggered by novel digital technologies such as mobile, cloud, big data, artificial intelligence (AI), and metaverse.

In particular, the era of full digital transformation emerges where major technologies (IoT, metaverse, 5G, mobile) are internalized in the era of the Fourth Industrial Revolution. Therefore, the science & technology (S&T) knowledge infrastructure provision system needs to be replaced with systematically supported core technology-based R&D activities.

In addition, as the importance of open science is reinforced in the overall research environment to overcome and respond to national and temporal crises, global solidarity and collaboration are required to address the global crisis amid the COVID-19 pandemic. Accordingly, global collaboration is practiced to share and utilize all relevant information anytime and anywhere.

There is a growing demand for open science services that can allow anyone to adopt S&T knowledge infrastructure in a timely manner. The activities related to open science are spreading globally based on openness and cooperation. The open science policy and open access information distribution system transformation are addressed as a major issue by international organizations including the OECD and academic and research institutions such as JISC (Joint Information Systems Committee) in the UK, the Max Planck Society in Germany, and CERN (Conseil Européen pour la Recherche Nucléaire) in Switzerland. This is done to maximize the economic ripple effect of knowledge in the S&T field. A national initiative is also undertaken in Korea.

Similarly, there is an increasing demand for integration to utilize S&T knowledge infrastructure. It is greatly crucial to create a connected infrastructure that maximizes the convergence synergy among industry, academia, and research institutes, to prepare for the era of open science and the Fourth Industrial Revolution, and to build a dynamic data ecosystem of a virtuous cycle where resources and data are actively shared with each other, thus creating new values. Knowledge should not be produced independently, but should be created extensively via its exchange and collaboration, to build a sustainable knowledge ecosystem. Accordingly, meaningful and high-value-added knowledge resources can be produced.

At a time when it is necessary to build an S&T knowledge infrastructure service system to enhance national S&T competitiveness, data openness and convergence are essential for the transition to data-centered research, called fourth generation R&D. S&T knowledge infrastructure in the era of the Fourth Industrial Revolution is a key factor for sustainable economic growth, and its efficient use determines national and industrial competitiveness. An integrated system approach based on knowledge infrastructure is required to profoundly support the entire R&D cycle integrated with S&T knowledge infrastructures.

In other words, a system is also required to increase the research productivity of researchers and provide S&T knowledge infrastructure, to support S&T innovation. A major transformation of the R&D environment is required currently in the era of the New Normal for the transition to the digital economy. It is also desirable to overcome and respond to global crises and cope with social changes such as population reduction and the ontact economy. The adoption of automation and smart technology increases, an environment for sharing global research data and information is being created, and the digital transformation of the entire social economy is in full swing (Noh, 2021).

The innovation of the R&D environment is required to strengthen the data, network, AI (DNA) ecosystem, and digital transformation of research activities. The national DNA policy needs to be completed from the perspective of platform and integration in line with the New Normal era. In the era of digital transformation, an online open integration platform is required where anyone can use S&T knowledge infrastructure in an integrated manner, regardless of online or offline. In addition, for the accelerated transition to the data economy, systematic integrated management of S&T information, active linkage and utilization of S&T information, and open science activities are essential to actively provide the infrastructure and services currently in place for data openness and to offer the knowledge infrastructure related to data openness and sharing in a timely manner (Research Information Network, British Library, 2009).

Next, it is necessary to comprehensively understand

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and support the research environment by analyzing the needs and information usage of the users of S&T knowledge infrastructures, such as S&T information and research data analysis services. Service quality and competitiveness can be improved by applying qualitative research methodology, to prepare initial knowledge and a theoretical ground for the behavior of users of S&T knowledge infrastructure. Furthermore, an understanding of the role of researchers in detailed activities at each stage of the R&D cycle from the beginning to the end, and then to publication, would enable the design and implementation of more efficient information services and systems.

S&T knowledge information and data provided on the S&T knowledge infrastructure integrated service platform are transferred to various users such as government bodies, companies, research institutes, and individual entrepreneurs, thereby improving national R&D efficiency, contributing to resolving information inequality and information gaps, and thereby saving time and costs required to visit individual websites to utilize different services, reducing service blind spots, and enhancing usability.

This paper describes the ScienceON service as a platform to support the entire R&D cycle by linking and merging S&T knowledge infrastructure, as well as to promote ontact research activities. The detailed functions and strengths of ScienceON in supporting the entire R&D cycle is also explained. In addition, the importance of ScienceON services, which will play a key role for open science-based digital transformation in the R&D environment, is reiterated by presenting tools and achievements that support ontact research activities.

Chapter 2 describes the current state of knowledge infrastructure services in some countries worldwide and Korea for ontact research support and digital transformation. Chapter 3 discusses the functions of ScienceON and its support process for an entire R&D cycle. Chapter 4 explains the method, status, and performance of supporting ontact research, while Chapter 5 concludes the paper.

2. RELATED WORK

Major countries are already promoting the integrated online provision of government policies and public services. Certain developed countries such as the United Kingdom and United States have introduced the concept of "One-Government" to solve the inconvenience to citizens caused by the provision of mixed services of different institutions and have been proceeding with a national competition on provision of administrative services in one place.

In Canada, 130 major administrative services out of 1,500 individual portals of government ministries and public institutions were first integrated and intertwined by 2006, and then the common functions and processes of each individual portal were shared successively. Servicecanada.gc.ca, a specialized portal, provides services by consumer and subject, along with personalized services operated separately.

The Japan Information Platform for S&T Innovation (JIPSTI) is operating a portal site to guide 12 databases and services provided by JST (Japan Science and Technology Agency) in an integrated manner, together with S&T information and research support information. JIPSTI started providing links to JST's major literature-oriented services websites including J-STAGE, J-Global, and J-DreamII, and later strengthened analysis services based on literature data contained in individual databases.

The United States has developed a general-purpose language model GPT-3 that learned more than 300 billion large-scale data using OpenAI. The UK Digital Curation Center offers various consulting and customized education services related to data management and curation-related activities. Furthermore, 33 major universities, including the University of Michigan, connect the information and achievements of projects performed by each research institute and relevant personnel via a network to build an information and data infrastructure, and are currently expanding their efforts at a federal level to analyze and share research processes and results, as well as to stimulate collaborative research activities. Moreover, infrastructure construction is planned and progresses to promote collaboration in research and education. Several universities, research institutes, and service providers in the United States are participating in the national collaborative infrastructure, and more than eight million researchers are employing cloud services connected to the infrastructure.

The Netherlands provides group management services to support the organization of virtual research groups comprising researchers from various affiliated institutions and research fields. R&D collaborations are supported in various ways in Japan, such as building an R&D cooperative network, offering collaborative services, and developing digital content, to provide a joint utilization system service for research resources.

S&T projects and research have been conducted based on the understanding of the entire R&D cycle. The Re-

search Information Center (RIC), as a digital research support environment platform developed and based on the entire R&D cycle modelling, ensures easy accessibility to information resources, information management program, and collaboration support tools that can be used at each phase of the entire R&D cycle.

The virtual research environment (VRE) developed by JISC in the UK supports the utilization of various re sources and technical infrastructure required for research activities in all academic fields (Brown, 2013). In addition, there are cases in which services and tools to support R&D activities have been developed at home and abroad, and are utilized in various fields. At a time when the platforms that provide metaverse-based virtual collaborative spaces such as Gather.town and V-STORY are growing, research collaboration and academic networking are enabled by sharing papers with fellow researchers, using the bibliographic management program based on researchers' social networks. SciVal provides tools and services designed to underpin the research planning stage and research performance analysis solutions as a rationale for researchers' strategic decision-making. Similarly, the research community in Australia (Australian National Data Service, ANDS) provides a fast and interactive self-service for computing infrastructure, software, and data, and also connects and analyzes various information on papers and research projects in Japan (JST). The prime examples to support R&D activities can be found in the support of strategic decisions and the provision of AI-powered high-precision translation services (Lee, 2020).

The Convergence Service Center at the Korea Institute of S&T Information (KISTI) has developed and operates the ScienceON service, an S&T knowledge infrastructure, to provide a platform for sharing and utilizing research resources for open science (KISTI, 2022). It supports ease of access throughout the entire R&D cycle by linking and converging academic information, research data, analysis functions, supercomputing environments, and infrastructure required for research in one place. Particularly, various functions and services are being developed to further non-face-to-face collaborative research activities (Noh & Wang, 2022).

The conditions for digital research environment creation and open collaboration (OC) are as follows. First, an environment should be provided where infrastructure and resources such as information and research data can be accessed and utilized. Second, there should be a collaborative environment in which researchers from various fields can participate. Third, it should be possible to maximize research results by sharing and exchanging feedback on the research process and results. Fourth, researchers should be able to benchmark and recycle the expertise of others. The final condition is that non-face-to-face research should be feasible and communication support tools should be extended.

ScienceON introduced the MyON feature in 2019 to develop an open collaborative environment. It is a non-face-to-face research activity space for openness, voluntary participation, collaboration, and sharing of research processes and results as well as a research environment configuration for using S&T knowledge infrastructure to achieve specific research objectives.

A MyON project will be open to others, when a MyON project is created by a researcher as a cyber research environment with information, data, functions, external research tools, knowledge memoranda, and files for each research stage configured based on the research topic and purpose. Other researchers can refer to the research process of others and participate in the research of interest with no limitations, thereby enabling them to collaborate with each other.

In addition, MyON connects and provides a non-face-to-face communication tool (KAFE Webinar) between research participants, enables them to share expertise and outputs generated during research, and readily provides functions for joint problem-solving activities. Currently, approximately 150 MyONs are actively used in the ScienceON.

The Convergence Service Center consistently en deavors in expanding the connection and convergence of knowledge infrastructure and increasing collaborative tools for efficient collaborations and smooth communi cation among researchers. In the future, the provision of customized information, intelligent curation, and issue response services will be presented for researchers to eas ily access MyON on various devices at any time, as well as use and share the process and results of ongoing research as well as the information, data, and functions required for research (KISTI, 2019).

3. S&T KNOWLEDGE INFRASTRUCTURE INTEGRATION PLATFORM (SCIENCEON)

3.1. Target Model & Architecture of ScienceON

This section examines the main functions, structure, and architecture of ScienceON, and then explains its role as a support tool for the entire R&D research cycle.

The S&T knowledge infrastructure, ScienceON, is a

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service that supports R&D activities based on a customized and preemptive one-stop service by linking and converging national R&D information, S&T information, research data, and knowledge infrastructure.

The ScienceON service was initiated in January 2019 to address the increasing demand for integration and unification to utilize S&T knowledge infrastructure, con struct an open science environment for data-centric R&D activities, and build an active support system for researchers' R&D activities using intelligent curation services (Kim et al., 2019).

The objectives of ScienceON service are as follows. First, it aims to reinforce the accessibility and usability of users by guiding, providing, and merging S&T information, research data, knowledge infrastructure services, and functions. Second, it attempts to improve the efficiency of R&D research with uninterrupted services. Third, it attempts to realize the popularization of S&T by laying out an environment that can be used effortlessly and conveniently by the general public.

To achieve these objectives, the direction of integrating the S&T knowledge infrastructure was derived from five aspects, "channel," "process," "service," "DB," and "infrastructure"; in addition, an integrated service target model was designed, as illustrated in Fig. 1 (Lee et al., 2019). The objective in terms of channel is to design a convenient UR/UX with which anyone can easily use the service. Regarding the aspect of process, it is aimed at realizing a one-stop service offering processes seamlessly via linked knowledge infra structures (Lee et al., 2021).

The objective in terms of service is to provide a service model for the entire R&D cycle, per purpose of use and usage behavior. Regarding databases, a database management system (DBMS) was built to provide integrated services on information and data, knowledge infrastructure status, and membership management. Finally, the objective in terms of infrastructure is to execute a DBMS, application system, and operating system with information technology to fulfill intelligent integrated service. The integrated service system architecture is defined such that users can flexibly utilize knowledge infrastructure services and sub-functions that can support the entire R&D cycle process in all possible situations.

A microservice architecture was presented as an optimal architecture that can provide integrated services by interconnecting the KISTI knowledge infrastructures. It comprises a user interface, API Gateway, integrated service/knowledge infrastructure microservice, and database, as presented in Fig. 2. API Gateway is a server that functions as a gateway for all API requests delivered to the integrated service. It is a service that allows a researcher to easily create, publish, maintain, monitor, and take security

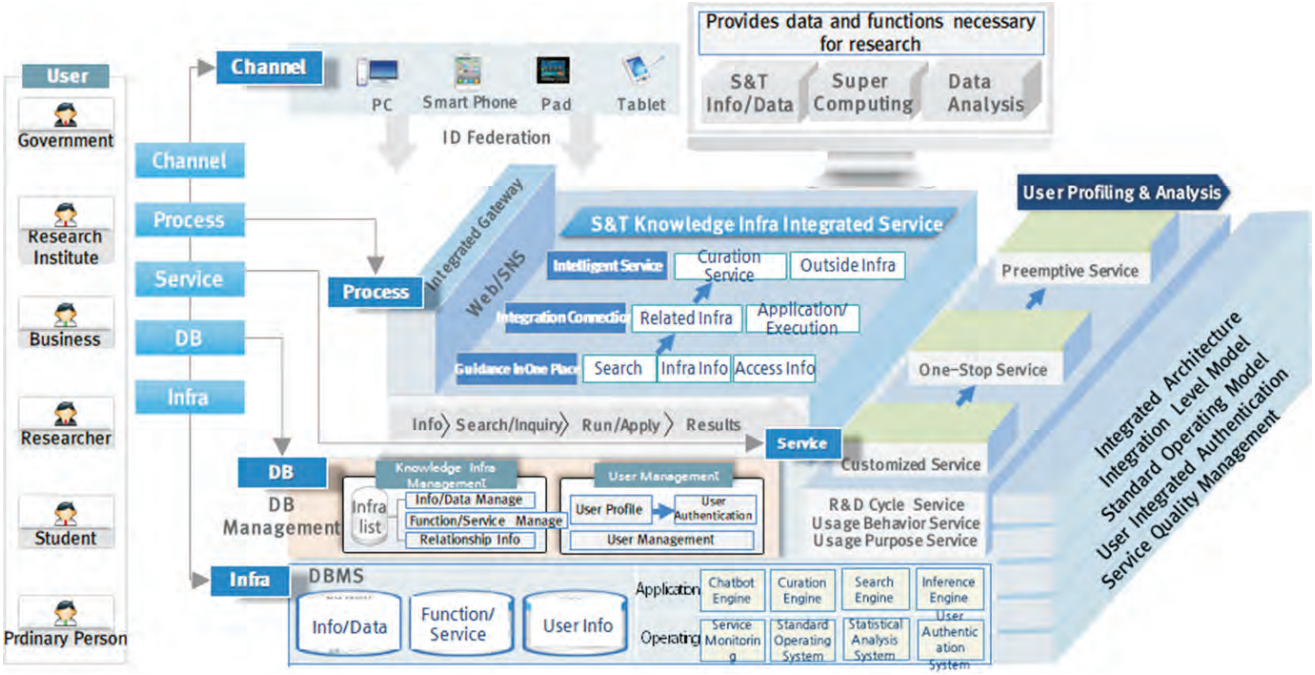

Fig. 1. ScienceON target model. S&T, science & technology; DBMS, database management system.

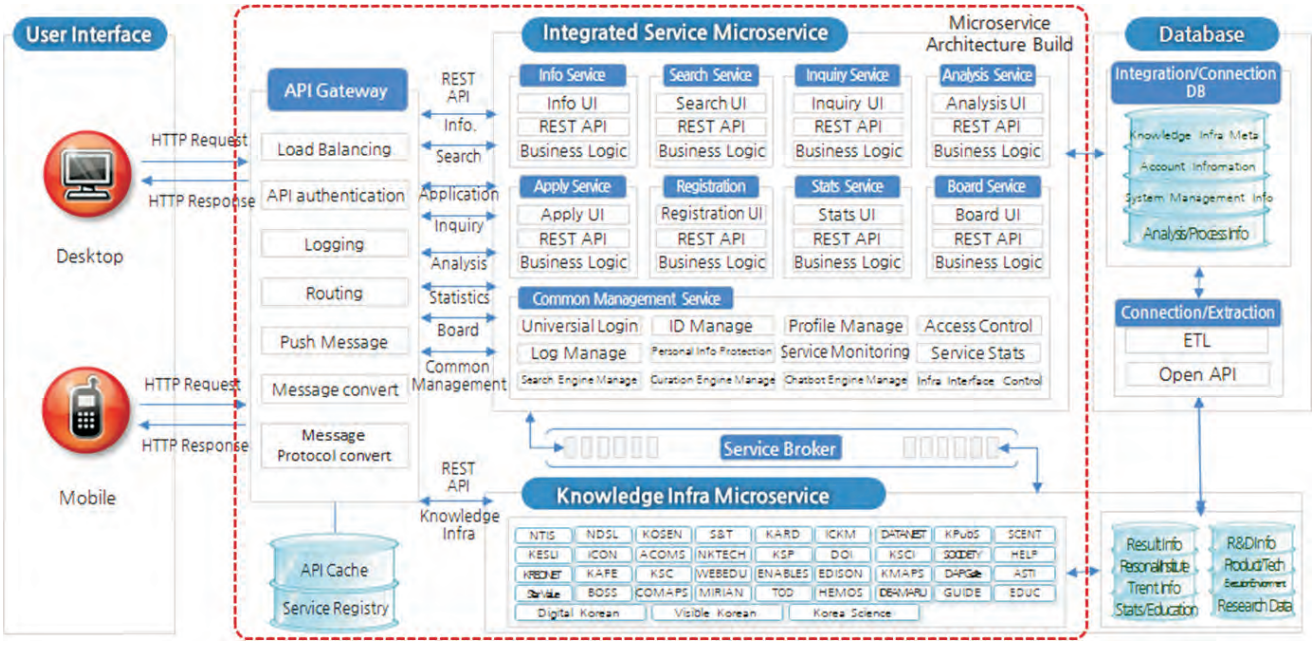

Fig. 2. ScienceON system architecture.

Fig. 3. S&T knowledge infrastructure integrated retrieval and category search. S&T, science & technology.

measures on an API as a key component in the microservice architecture. The integrated service microservices are subdivided into services for retrieval, guidance, inquiry, analysis, application, registration, statistics, bulletin board, and common management. They can be changed and combined with other services in a straightforward manner. The knowledge infrastructure microservices connect and extract information on performance, R&D, personnel, institutions, products, technology, trends, statistics, education, and research data via the knowledge infrastructure run by KISTI to form a linkage and integrated database.

3.2. ScienceON Main Features

3.2.1. Provision of Integrated Retrieval and Classification of S&T Knowledge Infrastructure

ScienceON has been built and developed by logically connecting and integrating individual knowledge infrastructure services via a system architecture configuration based on the target model of integrated service. It provides various services via the integrated connection and convergence of knowledge infrastructures. In addition, ScienceON provides all researchers in industry, academia, and institutes with the guidance and integrated retrieval function and environment for connected and converged utilization of 28 types of KISTI's major S&T knowledge infrastructures and over 300 functions, along with information on over 160 million cases of S&T information, including domestic and foreign academic papers, patent information, national R&D reports, trend information, and researcher information. As illustrated in Fig. 3, existing academic information can be easily searched and conveniently utilized using ScienceON integrated search, while information data and knowledge infrastructure are linked

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and provided to support users and conduct R&D activities in one place.

3.2.2. AI-powered Paper Summary

This is an information service that processes academic information based on AI technology and provides researchers with opportunities to acquire knowledge quickly without difficulty. The paper summary service and patent information standard industry classification directory service are provided by applying the document summary/classification technology based on the BERT (Bidirectional Encoder Representations from Transformers) model. The sentence semantics tagging documents were manually generated by research topics, research methods, and research results from approximately 10,000 papers before the application of deep learning AI technology based on the BERT model. The service offers AI-powered paper summary service on approximately 25,000 papers and presents standard industry classification directory retrieval function and patent technology keyword information for more than 1,000,000 patents.

3.2.3. Personalized Recommendation and Issue Response

Various personalized recommendation services have promptly developed and presented the information necessary for a user's R&D activities. Optimal academic information and related knowledge infrastructure are suggested as ScienceON retrieval results based on the analysis of user profiles and log information. Various issue response services are provided to identify research topics or support policy-making activities by categorizing the knowledge infrastructure of academic information corresponding to issues such as COVID-19 and carbon neutrality. The MyON service is available as an OC support service that allows users to set up information, data, and knowledge infrastructure necessary for R&D activities by a project unit, utilize them when necessary, and share them with other collaborative researchers.

3.2.4. Connection and Convergence of S&T Knowledge Infrastructure

A paper timeline service exhibits research content related to a specific paper in a time series by linking information and data. Without difficulty, a user can understand the overall flow of the subject and grasp subject keywords as well as the relationship between the paper citations. In the future, the service is planned to be expanded to include the purpose of citation and core research topics.

A scenario-based knowledge infrastructure utilization service has been developed in accordance with demand, to simultaneously utilize information provision, analysis, and experimental environment information, including the need for services to utilize a distributed research environment at once. The ScienceON scenario utilization service, equipped with the knowledge infrastructure API, considers the convenience of users and recommends related scenario utilization services such as taking educational courses, finding promising technology experts, utilizing supercomputing, using technology roadmaps, and developing R&D plans. Furthermore, it provides specific users, such as junior researchers and researchers of small and medium-sized enterprises, with a knowledge infrastructure utilization service by identifying use cases centered on user demand. In addition, it defines bundled services that these users can receive from the ScienceON service and provides a connection point to individual knowledge infrastructure, including related ScienceON functions suitable for specific situations. In Fig. 4, the left side is a screen of the thesis timeline service that provides citation relationships of papers in the order of publication year, and the right side is an example of a utilization service that

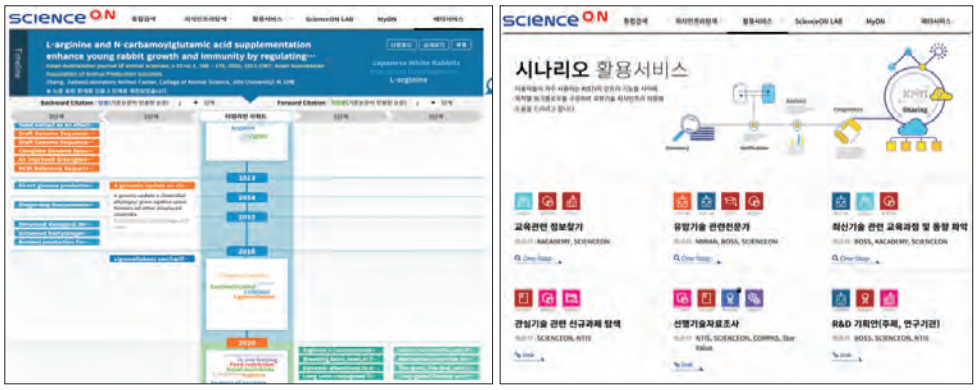

Fig. 4. Paper timeline and scenario utilization services.

provides a series of functions based on possible scenarios for conducting research.

4. ONTACT RESEARCH ACTIVITIES SUPPORT AND UTILIZATION RESULTS

Various information and platforms which include actively promoting digital-based non-face-to-face businesses, such as telemedicine services and establishing a cloud-based research environment, are being developed and operated to support ontact activities in various fields. KISTI supports ontact research activities by providing ScienceON service and online-based data collaboration infrastructure. Non-face-to-face online educational activities are supported by expanding the web-based open platform "EDISON" to universities. The platform is equipped with simulation software and content for computational science and engineering that enables virtual experiments. Various research institutes at home and abroad employ the webinar platform, an online collaboration tool, which provides free video conferencing services for online classes and seminars on the high-performance National S&T Research Network (KREONET). Moreover, DataON service is available as a platform for research data registration, management, and utilization. Non-face-to-face research activities are actively supported via the service of "Nurion," one of the world's top ten national supercomputers. In this environment, ScienceON interconnects various research collaboration services and functions of KISTI, providing suitable access points for effortless utilization in cyberspace.

4.1. Activation of MyON-Based Ontact Research Activities

National linkage and joint utilization of research and educational resources are required to improve the efficiency of researchers. The Korean Access Federation (KAFE) of KISTI built and operates the nation's first ID federation to stimulate common utilization of the nation's research and educational resources and collaboration among students, professors, and researchers. The objects to be linked to the MyON service, a personal research environment of ScienceON, were considered from the viewpoint of online exchanges of opinions, holding meetings and seminars, and transferring files. The webinar service was linked with MyON to enable online seminars, and databases were connected in real time for two-way integrated logins and creating seminars.

MyON is an ontact research activity support tool that ensures openness, voluntary participation, collaboration, and sharing of research processes and results in a cyber research space, based on the use of S&T knowledge infrastructure. It has three advantages in conducting research in an ontact environment. First, a cyber research environment can be freely created and utilized for joint research activities by configuring information, data, functions, external research tools, knowledge memos, and files for each research phase according to the research topic and

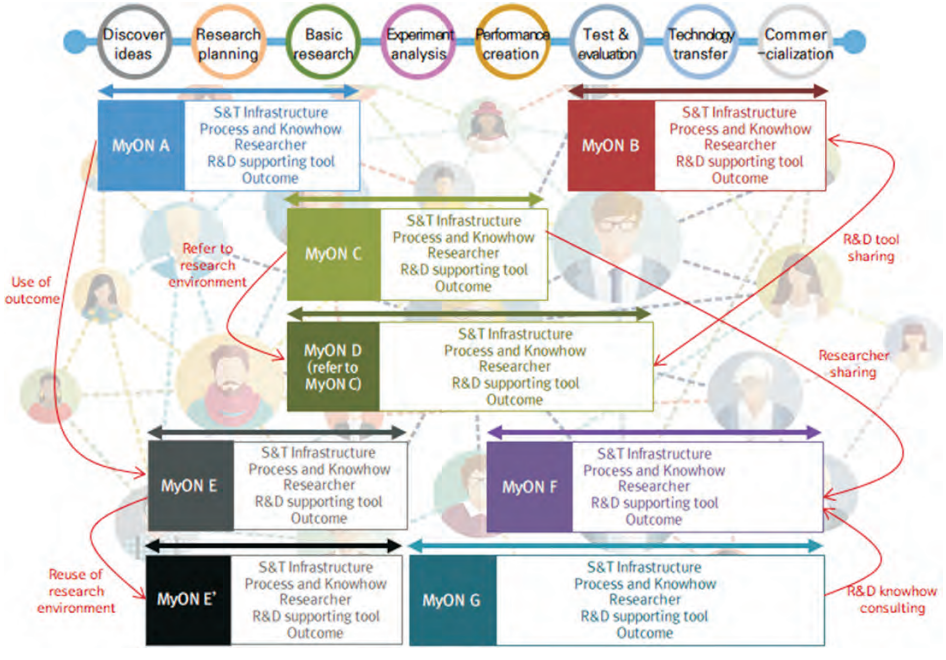

Fig. 5. Conceptual diagram of MyON. S&T, science & technology.

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purpose. Second, by creating a MyON project, anyone can refer to and utilize the research process of others, and freely participate and collaborate in their research of interest. Third, it supports non-face-to-face communication tools between research participants and promotes the sharing of knowledge and results generated during research to solve common challenges. The aim of MyON is to facilitate the utilization of infrastructure required for research and share research processes, know-how, and results to enhance efficiency in addressing research challenges. Fig. 5 illustrates the conceptual diagram of MyON as an OC research environment.

Creating a project with MyON, ScienceON's personal research environment, facilitates sharing and employing all information, knowledge, and files necessary for research with collaborators. Various collaboration tools are made to be easily utilized to activate non-face-to-face research activities while conducting joint research within the MyON. Researchers logged into ScienceON can frequently hold web-based meetings and seminars with collaborators, transfer large files, and collect opinions in MyON created for specific research purposes. The integrated login system even allows anyone who is not a KAFE service member to create seminars without separately logging in to webinar, webmeet, filesender, and teatime services. The generated seminar information is stored in the KAFE service database; however, the integrated login system automatically identifies the user as a ScienceON member and allows the seminar database record stored in the KAFE service database to be saved in synchronization with the ScienceON database.

In other words, researchers adopting MyON perceive the non-face-to-face research tool as a function provided by ScienceON, and create seminars, hold meetings, and file transfer as a one-stop service. In addition, as the seminar and meeting information is deleted, the corresponding flag information is synchronized between the two services, and the seminar opened in the MyON environment can be deleted in real time. Fig. 6 illustrates the results provided by linking the ontact research activity tools in the environment where S&T knowledge infrastructures are utilized. Researchers can create and participate in online research projects with fellow researchers in a non-face-to-face environment. While carrying out the project, they can jointly utilize the necessary data, information, and functions, and easily access related research materials. In addition, online seminars and real-time chat tools support easy research activities.

4.2. ScienceON Ontact Research Activities Performance

ScienceON provides over 160 million cases of S&T information, data, information analysis tools, and supercomputing utilization environment to meet various demands of researchers conducting data-based research. Researchers can create a MyON project to achieve specific goals and share research processes and results with collaborative researchers in a non-face-to-face environment. Several MyONs are actively adopted, where data-based research is conducted with discovery of and support for cases in fields such as energy, health care, and life sciences.

In particular, the Center for Advanced Meta-Materials (CAMM) at the Korea Institute of Machinery and Materials requested to link ScienceON and the Engineering Design Platform for Meta-structures (EDPM), to conduct meta-material engineering design research. ScienceON furnished the MyON cyber research environment to provide the S&T information and research data necessary for

Fig. 6. MyON ontact research support tool linkage.

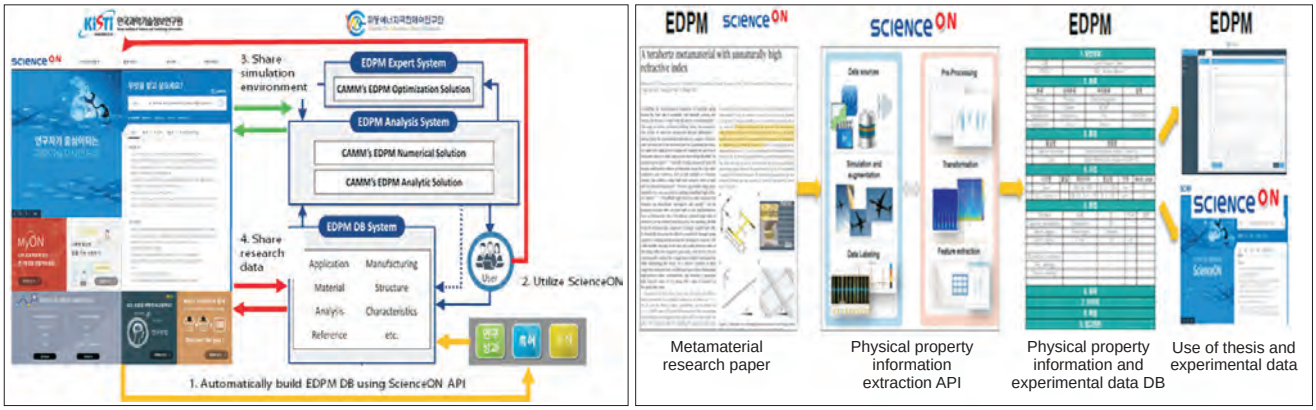

Fig. 7. ScienceON-EDPM linkage process. EDPM, Engineering Design Platform for Meta-structures.

meta-material design and development, and supported a supercomputer-based modeling and simulation environment. ScienceON's paper search results were directly uploaded for EDPM's online analysis. The linkage between EDPM and ScienceON was enhanced to ensure that the analysis results are loaded into ScienceON's research data, thereby facilitating meta-material design research.

In the VRE space MyON, the participating researchers shared their meta-material analysis needs with each other, retrieved and utilized S&T information and research data necessary for analysis, and performed ontact research by repeating the simulation of the process of reproducing and feeding back various meta-material analysis results. Fig. 7 illustrates a conceptual diagram of the linkage process between ScienceON and EDPM. The experimental data and results were automatically extracted after researchers' perusing of research papers on ScienceON related to meta-material analysis, and the EDPM database was automatically constructed using the data. At this point, ScienceON API was adopted, and meta-materials and structural information were extracted and adopted as simulation input values. After that, metamaterials were reanalyzed using simulation tools, and the resulting research data were shared. As such, ScienceON provides an environment for integrated utilization of knowledge infrastructure that enables not only data search and utilization, but also online simulation of search results and user data and sharing the results with colleagues.

5. CONCLUSION AND FUTURE WORKS

KISTI developed and is operating various information platforms to support ontact activities in various fields, such as actively promoting digital-based non-face-to-face businesses, including telemedicine services and establishing a cloud-based research environment. It provides a research environment that enables non-face-to-face collaborative research via the ScienceON service. In particular, the MyON feature of ScienceON promotes participation by researchers of various fields and facilitates collaboration and convergence research by laying out an environment where resources and infrastructure such as S&T information and research data can be accessed and utilized. Moreover, ScienceON ensures the convenience for improvement by sharing research processes and feedback, enables benchmarking and recycling of the know-how and knowledge of other researchers, and offers tools to support non-face-to-face research and communication. Particularly, extracting experimental data, modeling based on the data, and sharing and utilizing modeling and simulation results for meta-material analysis can be considered as one of the excellent achievements created with ScienceON in terms of activating ontact collaboration research. The scope of support needs to be expanded so that researchers can freely perform data-based collaborative research by directly linking various online tools at home and abroad that support ontact research activities (cloud connection, large file transfer, real-time conversation and meeting, scheduling, etc.).

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CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

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