Infrastructure Development for Strengthening the Capacity of International Scholarly Communication

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Science Information Infrastructure Working Group

Research Environment Infrastructure Group

Subdivision on Science, Council for Science and Technology

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Preface

Japan has achieved social and economic growth through its strengths in science and technology. However, in the face of globalisation, various factors, including the continued appreciation of the yen, the emerging economic powers, and a declining birth rate combined with an aging population have weakened Japan's competitiveness in the world and resulted in a prevalent sense of stagnation in society.

Intellectual assets are among such important resources for Japan, which is a country with limited material resources, that greater efforts on the promotion of science and technology, and the promotion of creative and forward-looking scientific research, in particular, have to be taken than ever in order to enhance Japan's international competitiveness.

To promote scientific research, it is essential that timely and wide access to information be guaranteed to those who need it. At the same time, it is important to promptly publish and distribute outstanding research results domestically and internationally, and to make use of them in society. Doing so will increase Japan's intellectual presence and attract excellent researchers from around the world, leading to further development of science in Japan and stimulation of society as a whole.

While Japan's scientific contribution plays a leading role in many fields worldwide, it does not necessarily contribute as much to scientific communication as it is expected. There are, for instance, few if any leading scholarly journals, which are effective means for publishing articles that reports research results, resulting in approximately 80% of papers written in Japan being published in international journals. Outstanding research results may not have been widely available internationally because some of them are not digitised. In light of the above facts, we need to digitalise more research results and develop Japan-based publishing mechanisms that allow for better international information sharing.

The Fourth Science and Technology Basic Plan concurrently proposes the development of such infrastructure for scientific communication in terms of the following tasks: Digitalisation of research results and educational resources, open access, institutional repositories at universities and other research institutions, networked digital information resources, and integration of thus far fragmented infrastructures for scholarly communication into one knowledge infrastructure.

Furthermore, scholarship, science and technology after the Great East Japan Earthquake are expected to meet the needs and challenges of the society at large, to solicit experts themselves to provide information, and consequently to promote interdisciplinary studies with a view to solving real problems in society. All this leads to the necessity of the improvement of the infrastructure for scientific communication.

In the international trends, electronic, online journals have come to prevail so widely, published by commercial publishers as well as by established scholarly societies and licensed universities libraries, that access to information is generally improving dramatically. On the other hand, incessant increase in subscription and the newly introduced "big deal" contracts are drawing more and more criticism, resulting in the shift to the promotion of open access, which provide free and unconstrained access to research results including scholarly articles.

At universities and research institutions, where the core of Japan's research and education is carried out, institutional repositories are being started and promoted to serve as the system for collecting, preserving, and disseminating diverse scientific information (including results of research such as papers, research data, teaching materials, etc.) produced at the institutions and to utilise the information for future research and education. The effective deployment and the strategic positioning of institutional repositories are important tasks in order for universities to play a substantial role in the much needed establishment and further development of the nationwide "knowledge infrastructure."

In enhancing Japan's contribution to international scholarly communication as well as promoting open access and launching and maintaining institutional repositories, incentive projects and infrastructural arrangements are indispensable. it is essential for the National Institute of Informatics (NII), the Japan Science and Technology Agency (JST), the National Diet Library (NDL), and the Japan Society for the Promotion of Science (JSPS), all of which have implemented various programs for the benefit of scientific information infrastructure, to work together to effectively and efficiently develop scientific information infrastructure, taking advantage of the needs and priorities for each institution.

The Working Group decided, in recognition of the situations described above, that it would meet for the current term to discuss the agenda and solutions that would be necessary for the development of infrastructure and the remodelling of system for the

purpose of strengthening Japan's contribution to international scholarly communication.

Since April 2011, the Working Group has held a total of 16 meetings, including interviews with interested parties, to understand the backgrounds and the current status as well as to discuss possible measures. The Group has concluded on the following four topics: (1) improvement of the Grants-in-Aid category for "Publication of Scientific Research Results (Scientific Periodicals)," (2) the steps toward the open access to results from competitively funded research, typically including JSPS's Grants-in-Aid for Scientific Research, (3) the role of institutional repositories in improving their functionality for scholarly communication, and (4) further coordination and cooperation among the institutions(NII, JST, NDL, and JSPS) involved in the infrastructural improvements for strengthening the basis of scholarly communication.

The Working Group hopes that Japan's universities, scholarly societies, and the related institutions will consolidate, make greater efforts to strengthen its contribution to scholarly and scientific communication and increase its intellectual competitiveness in the world.

1. Development of Scientific Information Infrastructure and Reinforcement of Japan's Scholarly Communication

a. Background

○ An improved infrastructure for scholarly communication is indispensable for the promotion Japan's internationally competitive scholarship and science, in researchers' sharing their research results, increasing efficiency of research activities, disseminating research results in society, implementing educational programs to make use of research results, and passing research results to future generations.

○ Scholarly research and scholarly communication are global by nature, and nowadays it is particularly important to take a strategic approach toward the promotion of research activities and the enhanced presence, backed up by the recognition of international trends.

○ The current scholarly communication is centred in the publication of research results in journals published by commercial and society publishers. Since the quality of published articles is assured by way of some refereeing system of each journal, which appears serially under the same titles, journal publishing serves as a mechanism for evaluating research results.

○ With the rapid development of computer and network technology, scholarly communication has been generally digitalised. While, in Japan, electronic journals are already the mainstream in natural science where international publication is a normal practice, the transition to electronic journals is yet to come in the humanities and social sciences.

○ Open access, which makes necessary research materials freely available on line in the advanced digital environment, is at the focus of immense international concern in response to the scholarly communication system that lacks flexibility as well as for the purpose of further improving scholarly communication. It must be clearly noted in particular that the idea of open access to the results of publicly funded research has come to be strongly supported.

b. Current Status

○ Although Japan's research produces results that are ranked at the world top level in a large number of scientific fields, the number of the journals with high impact factors (IFs) that are known worldwide are small. That might be attributed to the fact society publishers are based on a large number of numerous small scholarly societies, resulting in their impoverished editorial and refereeing systems and insufficient marketing capacity as well as, to some extent, to the language barriers caused by the use of Japanese.

As a result, about 80% of papers written by researchers in Japan are published in journals published abroad, with some being concerned about possible unfavourable treatment in the process of refereeing as well as possible unintended leakage of research prior to publication. Linguistic and other hurdles may prevent outstanding research results from being fully conveyed to the research community and consequently from being discovered. Japan has failed to promote journals as a platform for its researchers to take the initiative in scholarly communication.

○ To make contributions to international scholarly communication of the level that is naturally expected from Japan's position in the research world, the creation of international journals that have their basis in Japanese scholarly communities is much in demand.

The promotion of the journals originating in Japan that will be internationally influential is essential in order to increase Japan's intellectual presence and to protect submitted papers from being treated unfairly. This is also to cope with the concerns strongly expressed by the Science Council of Japan.

International journals that are published from will encourage outstanding research results originating in Japan to be published there, followed by subsequent quality submissions from overseas, and leading to the country's status as the centre of excellence in the relevant research areas.

○ In developing a future-oriented infrastructure for scholarly communication, it is hoped to accelerate a variety of initiatives that include conversion to digital online communication and appreciation the ideal of open access, with a view to the construction of "knowledge infrastructure" proposed in the Fourth Science and Technology Basic Plan. The digitalisation of and open access to diverse scholarly information produced in Japan will naturally lead not only to the enhanced international scholarly communication of Japan's research results but the promotion

of research activities of an interdisciplinary and innovative nature by way of shared research results.

○ Furthermore, the resulting knowledge infrastructure that takes digitalised, online open access for granted will inevitably facilitate the access to scholarly, scientific and technical information by the general public, let alone researchers, to an unprecedented extent.

c. Challenges

○ Some of the journals of high academic quality published by scholarly societies have been subsidised through JSPS's Grants-in-Aid for Scientific Research. As a result, the continuous publication and the constant information dissemination by such journals have, to a certain degree, been successfully ensured. However, the grants have been limited to covering the publishing expenditures of print-based journals. As we try to foster internationally influential Japanese journals, it is hoped that improvements will be made to help strengthen the capacity of international scholarly communication, including efforts to encourage online and open access publication of journals.

○ Objections and reservations are perceived about the initiative of making research results open access for reasons of its fundamental difference from the conventional system of scholarly communication in which users pay subscription fees to cover the publishing costs. Considering that research activities are only possible on the premise of free and active scholarly communication and that open access is a major international trend, however, we should make proactive efforts to make open access possible. Along with the publication of open access journals, it is also beneficial to utilise institutional repositories that are launched and operated at universities and other institutions.

○ Institutional repositories are started and operated for the purposes of collecting and preserving the results of education and research conducted at universities and research institutions, as well as of disseminating and distributing the results over the internet. Such repositories are expected to play a certain role not only in terms of open access in scholarly communication, but also in the construction of "knowledge infrastructure" in Japan. In order to accelerate the promotion of

repositories, it is necessary to further penetrate the recognition that development and strengthening of institutional repositories are important for the institutions which account for themselves in terms of their educational and research activities.

○ In strengthening Japan's scholarly communication infrastructure in consistence with the current international trends, direct grants to the publishing project by the Japan Society for the Promotion of Science (JSPS), will be complemented for the improvements of the environment by the Japan Science And Technology Agency (JST), the National Institute Of Informatics (NII) and the National Diet Library (NDL), which supports various aspects of scholarly communication. Such initiatives include the development of electronic platforms for online scholarly communication, the standardisation and linking of digital object identifying information and metadata for improved international visibility and accessibility, the federated search and automated classification of diverse information, and the proposal of new functionalities that are based on the measurement of usage. To achieve these goals, all these institutions are expected to cooperate and share responsibilities.

2. The Remodelling of the Section for the Grants-in-Aid for Publication of Scientific Research Results (Scientific Periodicals)

a. An overview of the subsidy for research by grants-in-aid

○ Grants-in-Aid for Scientific Research (KAKENHI), which will be abbreviated as GiA, are a major part of the subsidy programs designed to provide support for outstanding scientific research in Japan. The extent of scholarly research is understandably not limited to conducting research, but also covers the activities of publishing results and making them available for use in society.

In view of this, GiA categories include a section which is separate from other grants for basic research. That is the Grants-in-Aid for Publication of Scientific Research Results, henceforth "GiA-PSRR", is designed to assist financially with expenditures related to the publication of research results.

○ Among the purposes of GiA-PSRR are to promote the public accessibility of outstanding research results, contributing to the enhanced international exchange of scholarship as well as to help the promotion and penetration of scholarship and science in Japan. To fulfil these purposes, the provision of subsidies under the section called "Scientific Periodicals," henceforth "GiA-PSRR-SP", has been under operation to support periodical scholarly journal publishing by societies, or society groups which run the publishing enterprise jointly for the purpose of facilitating international scholarly communication.

b. Challenges Facing Grants-in-Aid for Publication of Scientific Research Results (Scientific Periodicals)

○ The current screening and selection process of GiA-PSRR-SP has allowed good journals to stably receive support through GiA framework. This has led to the criticism, though, that, despite being one of the categories of GiA whose scheme is a type of competitive funding process, GiA-PSRR-SP apparently has come to lack sufficient competition.

○ While the GiA budget is generally increasing, the allocation for GiA-PSRR-SP has been diminishing every year since its peak in the fiscal year 2005 of about 910 million JPY. In the fiscal year 2011, it came down to about 350 million JPY, roughly a

third of that in 2005. Some academic societies have managed to receive long-term supports, but the drastic budget reduction has discouraged applicants, resulting in a reduced number of applications.

○ In formulating the kinds of expense GiA-PSRR-SP covers, the assumption has been that journals are published in print so that the subsidy must be used for the direct publication costs, namely the costs for typesetting, printing and binding, to the result of failing to accommodate the growing trend of digital publishing. Other types of expense that are essential to journal publishing, such as those for refereeing and editorial assistance, cannot be covered by the grants, either.

○ The review criteria for GiA-PSRR-SP mainly concern the academic value of each application of publishing project. For reviewing the efforts of strengthening international outreach, only a limited range of criteria have been given, namely the number of paid copies distributed overseas, the percentage of foreign editors and referees, and the number of papers submitted from overseas.

○ The screening process for the GiA-PSRR-SP basically consists in reviews by peer researchers, as is the case with other grant categories. Because this system of the reviewing of academic value by experts has robustly continued, people who are actually engaged in journal publishing have not participated in the reviewing as peers. As a result, the screening system is not capable of adequately evaluating efforts to improve publishing practices.

c. A Course of Actions for Improving Grants-in-Aid for Publication of Scientific Research Results (Scientific Periodicals)

○ From the perspective of strengthening Japan's contribution to scholarly communication, we need to encourage the kind of journal publishing which ensures the diversity of research interests and thereby substantially advance scholarly and scientific research. To achieve these goals, it is important for GiA-PSRR-SP to give consideration such a way that the funding will enhances international competitiveness, taking into account the international trends of digital scholarly communication.

○ The following is the Working Group's proposal for the course of actions which is

necessary in remodelling GiA-PSRR-SP. The Working Group hopes that the proposal will be discussed internally more in detail by the Japan Society for the Promotion of Science, which operates the processes of screening applications and allocating grants in this category, along with the examination of the impact of the improvement.

(Providing grants for expenditures necessary for the publication of journals)

- In light of the progress of digital publishing, it is necessary to review the eligibility for application as well as the types of expense which the grant is allowed to cover in order to allow for support for the expenditures necessary for improving the methods of publishing journals (including refereeing, editing, and publishing).

- With regard to the eligibility of projects, the aid needs to be made available for project proposals that are designed to strengthen the contribution to international scholarly communication by way of journal publishing. In addition to programs implemented by individual academic societies, new initiatives which coordinate and consolidate communities of researchers in specific research area to start a new online journal in the area.

- With regard to the types of expense to be covered by the grant, funds should flexibly cover such project expenses as strengthen the capacity of international scholarly communication as well as the direct costs of publishing conventional print journals. However, in case the increased flexibility in application of the grant causes confusion in executing the budget on the part of academic societies, it is preferred that guidelines and examples be provided.

(Revision of the application guidelines to evaluate efforts to strengthen the capacity of international dissemination of information)

- It is to be desired to arrange the format of proposal in the way that the applying society itself sets goals for its own project of strengthening its contribution to scholarly communication as well as specifies the yearly progress plans for the entire period so that the review committee can review the application as a whole, together with an explicit statement prior to the application that the committee will prioritise the elements in the proposal which concern the improvement of journals toward stronger international contribution, such as digital publishing and internationalization.

・ With regard to the length of project period, the shift from the current practice of giving the grant primarily on a single-year basis upon applications from academic societies to the framework in which the grantee can show the results from the project which can be evaluated.

・ As far as the sectioning of application is concerned, it is important to relax the condition on used language not only because the percentage of articles in English in international journals is indeed approaching 100%, but because it is necessary to assess the quality of Japanese language journal projects more properly in reference to the characteristics of the field the journal specialises in. Considering the current status of international scholarly communication, it should be possible to set the default to English and allow the use of other languages exceptionally.

(Support for open access initiatives)

・ It is of vital importance to subside, by way of GiA, those projects which target the open access of online journals, given that we require journals based in Japanese societies to not only begin to compete on a par with but also go ahead of the existing American- and European-society based journals, strengthening their contribution to international scholarly journal communication

・ As a side note, it is to be remarked that, because journals that are not sold overseas are currently not eligible for GiA-PSRR-SP, open access journals cannot apply for the category. This requirement of paid distribution overseas should be removed to make both subscription-based journals and open access journals eligible for the grant.

・ To make explicit that open access journals are to be promoted as our policy agenda, we should give a thought to installing a new focus category of "Open Access Journals (Start-up Support)." In installing this category, the project period should be determined to accommodate the additional time it takes new journals to be recognised while, at the same time, simultaneous multi-category applications should be permitted to encourage open access journal initiatives towards the publication of new open access journals other than conventional subscription-based journals.

(The necessity of strengthening the category)

・ The category of GiA-PSRR-SP, which provides support for journals which publish

original papers, must be inevitably promoted also from the perspective of fostering influential journals that contribute to human scholarship and science in respective fields to equate Japan's contribution to scholarly communication with its research strengths.

(Other important matters regarding the improvement of Grants-in-Aid for Scientific Research)

- The structure and composition of the review process in GiA-PSRR-SP should guarantee the appropriate evaluation of the proposed projects in terms of their contributions to improved scholarly communication.

- It should be so arranged that a special consideration in the process of reviewing is to be given to those proposals which are based on a plural number of societies' collaborative efforts for the improvement of international scholarly communication.

- The upper limits on the amount of requested grant in the subcategories should be reconsidered, allowing for the possibility of removing the limits, from the perspective of ensuring the provision of necessary support at an appropriate scale.

  Interim measures for the transition to the proposed stable and sustainable multi-year grant from the current single-year grant cycle must be discussed.

- The change from the title of "Grants-in-Aid for Publication of Scientific Research Results (Scientific Periodicals)" should also be considered in light of the resulting revisions.

3. Establishment of Open Access to Results of Research Funded by Grants-in-Aid for Scientific Research and Other Competitive Funds

a. Necessity of Open Access

○ Results of scientific research are preferred to be shared as intellectual assets of all humankind in the first place. In particular, the results of publicly funded research should be widely accessible and available by the public. On this recognition, the current global trends are towards the promotion of open access that makes research results accessible by the users of the results without payment or other constraints, arguing against the situation where journal articles are increasing hard to have access to on account of ever more expensive subscription fees and ever stronger copyright protection.

The collection of education and research results and the establishment of open access are also promoted in the Fourth Science and Technology Basic Plan, which we need to actively address.

b. Ways of Establishing Open Access

○ There are two main ways of making research results open access. One is to publish papers in open access journals (including cases where a paper is submitted to a subscription-based journal but the author pays for the cost of making only his or her paper open access); the other is for researchers themselves to make their papers accessible online with the permission from the copyright holders, themselves included.

(Publication in open access journals)

・ Since journals have traditionally turned to subscription fees to subside publication, it is researchers that they have to turn to for the cost of making them open access and asking readers no financial burden for accessing them, unless there should be extra funding. As a result, there are still only a limited number of open access journals in Japan, given that to make open access possible, researchers have to be strongly motivated to submit and publish their articles in spite of the burden of publishing fees and that such a situation is naturally anticipated in which some journals might cease to be able to guarantee the quality and quantity of published articles in the consequence of changing the business model from subscription to

open access.

・ However, the fact that there are online journals with viable business models such as the mega-journals like PLoS ONE, published in the US, has led the Working Group to propose, as described above, that, in the remodelling of the GiA-PSRR-SP category, a special provision should be made so that new launch open access journals be encouraged and funded during their formative stage up to the time point they are reputedly established.

・ It is important for the funding agencies to unequivocally inform researchers, with the intention of discouraging them from avoiding submission to open access journals, that the financial costs incurred on the part of researchers, including publication fees, can be paid with the funds they award them. Incidentally, such payment for publication for research results is explicitly allowed in the current practice of GiA, and described in the Handbook and other documents and manuals.

(Publication on the internet)

・ Ways in which researchers make their publication public are characterized by the combinations of the elements in the three following viewpoints, subject to the copyright policies of journals publishing their articles.

1. Place
   - On the website of the funding agency that awarded the grant which made the relevant research possible
   - On the website of the institution the researcher is affiliated with
   - On the website the researcher hosts
2. Timing
   - At the time point when the result is published for the first time
   - No later than after a certain period of time determined by the publisher since its first publication of the results.
3. Content
   - Content finally accepted and officially published by the journal (publisher's version, or the version of record)
   - The author's final draft and other drafts

・ While various initiatives have been taken overseas for providing places where open access is made possible, in Japan, it is considered to be realistic to take advantage of "institutional repositories" as a vehicle for shifting to open access,

which are being developed as places for accumulating, preserving, and distributing education and research results owned by universities and other institutions. Researchers who works for a corporation or institution that has no institutional repository are to be advised to make their research results open access on their own.

・ The timing is subject to the decision of the publisher who holds the copyright. The elapsed time till open access is called "embargo period" and decided by the publisher from the point of view of protecting their copyright, varying from roughly six months to three years. Problem of the embargo period being long, it is problematic that researchers cannot decide whether they are allowed to publish their research results in other media because many of the academic societies in Japan have not yet established their copyright policies. Besides the problem of the large length of embargo period, the large number of Japanese society publishers have not decided on their copyright policy, thereby leaving researchers uncertain about whether they could make their research results open access by different media.

・ Publishers generally do not allow the version of record of an article to be put elsewhere, so, as a consequence, the version made open access tend to be the author's final version. On the other hand, there are concerns on the part of researchers that the distribution of different versions of an article means the existence of more than two sets of information about the same research results, which may cause confusion and undesirable. Because of this, some researchers publish only the bibliographic information.

・ Negotiation should take place with society and commercial publishers who hold copyrights with a view to making the timing as early as possible and the content as close as the version of record. It is also important to encourage researchers to actively take part in open access.

c. Other General Improvements

○ Funding agencies should require researchers to report to them the method of access to the results of the funded research, including it open access availability, as they need to in control of the relationship between funding and its consequences.

The research results report form of a Grants-in-Aid for Scientific Research has fields in which researchers fill with the web addresses and DOIs of their research articles. The registry of this information should be strongly encouraged so that research results could be widely available through the links from within KAKEN (Grants-in-Aid for Scientific Research Database).

4. Strengthening Information Dissemination Capacity through Utilisation of Institutional Repositories

a. Roles and Meanings of Institutional Repositories

○ A wide variety of intellectual outcomes produced at universities and other institutions are the core element in the construction of “knowledge infrastructure,” which is purposed in the Fourth Science and Technology Basic Plan, and need to be shared and utilised in society as valuable assets contributive to the country’s future growth.

It is universities and other research institutions wanting to meet the needs of society that are primarily responsible for the accumulation and dissemination of such intellectual outcomes, including making them open access, with their institutional repositories to be recognised as important means for fulfilling such social obligation, and to be developed and strengthened accordingly. This statement is consistent with the idea of the increased transparency of education and research at universities which was described in relation to the plan of the tentative "University Portrait," as described in the "Execution Plan for University Reform"(June 2012), put forward by the Ministry of Education, Culture, Sports, Science and Technology.

○ At universities and other institutions, the institutional repositories play a wide variety of roles, not limited to open access, which provide better environments for research, and teaching and learning exemplified below:

1. Collection and long-term preservation of intellectual content produced on campus
2. Infrastructure for scholarly communication, including publishing and provision of articles, data and research reports
3. Infrastructure for teaching and learning, such as one for the digitalisation, provision, and preservation of learning materials

○ The functionalities of institutional repositories provide can be summarised as follows from the standpoint of scholarly communication

1. Institutions can visibly grasp their entire intellectual assets through storing and preserving them in one location and avail themselves of the repositories to impress the society with their presence and excellence by promptly and widely make their education and research result open access from not only within but without.

   For users, institutional repositories provide one-stop access to the diverse intellectual assets of universities and other institutions from anywhere and, in

principle, for free.

Therefore, institutional repositories are expected to grow into a new communication media for scholarly communication.

2. Furthermore, they are also expected to subvert the current system of scholarly communication for journal articles, which causes access problems on account of high subscription fees allegedly through the oligopoly of commercial publishers.

b. Current Status of Institutional Repositories

(Current status of the development of institutional repositories)

○ Institutional repositories have been created and maintained by universities and institutions through librarians' voluntary efforts on the systems which are either developed individually or jointly, or based on open source softwares. Also, thanks to the advocacy activities and the support from NII and DRF (a broad community organisation for repository managers), the number of active institutional repositories has increased rapidly in recent years. Currently, institutional repositories have been serving at about 250 national, public, and private universities.

Japan is ranked fourth in the world with 136 institutions out of a world total of 2,199 registered at OpenDOAR, which is an institutional repository-related information site (as of April 2012).

○ Nevertheless, further improvement and penetration is necessary, considering that there are more than 1,000 higher education and research institutions in Japan, counting only the ones registered with Grants-in-Aid for Scientific Research as eligible institutions. In addition to the institutional repositories run by individual universities and other institutions, cooperative repositories are being actively started through institutional cooperation in various communities and regions. Moreover, NII launched the JAIRO Cloud system in fiscal 2011. JAIRO Cloud provides a shared repository system for universities and institutions that lack resources for developing their own system. JAIRO Cloud is expected to accelerate the establishment of institutional repositories.

In the future, all universities and institutions should strive to create and promote their own institutional repositories to ensure diversity in the values they offer.

(Cross sectional coordination and data analysis of institutional repositories)

○ In effectively developing and utilising the system of institutional repositories, coordination and system-wide data analysis across repositories are essential. In

Japan, NII has installed JAIRO, a tool for searching across institutional repositories which provides the overview the country's status quo, along with a data analysis tool (IRDB) for analysing the content through JAIRO. With regard to user analysis, a system called ROAT has been designed and tested for use under the leadership of Chiba University Library, which allows for segmenting accesses by the country, the kind of institution, etc. from the access logs uploaded. Coordination with institutions overseas, OpenDOAR, OAIster, and other information sharing sites for institutional repositories have been started and operated.

○ According to an analysis by IRDB, there are about 510,000 bulletin articles, about 160,000 science journal articles, and 40,000 theses out of the roughly 1,000,000 content materials which are deposited in institutional repositories. Those materials are most accessed from within Japan, and with regard to the content, bulletin articles are most accessed (as of May 2012).

○ Institutional repositories have become an important tool for publishing bulletin articles at private universities and in the fields of humanities and social studies. In addition to improving the universities' information dissemination functions, the repositories are expected to enhance the quality of bulletin articles by allowing them to be seen by a large audience when they are published.

c. Challenges and Considerations in Enhancing the Functions of Institutional Repositories

(Reinforcing content registration)

○ The challenges in the development of institutional repositories include the understanding on the part of institutions and researchers, system development, and securing human resources, but the most important task is the increase of deposited content.

At universities and other institutions, the content is deposited primarily by library staff with cooperation from departments and researchers.

The deposit of content is basically done by each researcher who exercise the right of "self-archiving". However, incentives for researchers to self-archive are not necessarily strong when their articles are already published in journals, since the information is already accessible and because of the duplicated manual labour for the researcher.

Another obstacle is that, while permission from the academic societies or other organisations that publish journals is required for depositing in institutional repositories, many of them have not yet stipulated their copyright policies

regarding the open access through institutional repositories.

- In order to promote self-archiving, universities and other institutions have devised various ways of reducing the burden of researchers. One example is a system in which researchers are only requested to turn in the content data made PDF, and in which library staff handles the rest of the work on behalf of researchers, including the process of checking copyright policies. Other examples include linking of research results to a researcher database published by the university, and the function to export information to the Grants-in-Aid for Scientific Research's research results report form. It is also important to share these systems.

- It is desirable to come up with systems that will more easily induce content to institutional repositories, especially in the case of the journal articles could be sent directly from publisher to repositories, with permission from societies with solid copyright policies.

(Enhancing awareness among universities and researchers)

- Universities and other institutions need to assist researchers in understanding that registration of their research results in open access institutional repositories is beneficial to researchers themselves because it facilitates searches by domestic and international audiences, and assists distribution of information. At the same time, researchers should be reminded that making their research results open access leads to the fulfilment of the university's duty of returning scientific information to society.
- Moreover, it should be made clear that the institutional repository is a function of disseminating information that universities and other institutions need to make a concerted effort to improve, and that libraries are in charge of such tasks. It is important to provide support based on this understanding.

(Incorporation into evaluation)

- The efforts towards the establishment of institutional repositories for information dissemination should be added as a subject of evaluation in institutional certified evaluation systems. Understanding and publicising the status of such endeavours through Science Information Infrastructure Statistics of Colleges and Universities and through JAIRO are expected to promote the active development of institutional repositories.

  It is also important to recognise researchers' information dissemination efforts through content registration in institutional repositories as their achievements in education, research, and social contribution. Such efforts should be taken into account as one of the evaluation points when universities evaluate individual researchers.

(Types of information to be registered)

○ The content to be registered in institutional repositories is expected to include the items listed below. It is also important to pay attention to the uniqueness of information and focus efforts on the registration of unique resources owned by individual universities and institutions, as well as resources that are difficult to distribute through other systems.

- Papers that have been published in journals
- Papers published within universities in research bulletins, etc.
- Theses
- Documents for oral presentations at international conferences, etc.
- Technical reports, research results reports
- Research data
- Teaching materials

In particular, promotion of the distribution of research data is likely to gain importance in the future as part of the establishment of knowledge infrastructure. However, as we register research data in institutional repositories, we need to take appropriate measures based on the need to accommodate its enormous data volume, while taking the future innovations in the cloud technology into account. Such measures may include the selection of data to distribute through institutional repositories.

○ It should also be taken into account that, with some types of content, registering in institutional repositories and receiving a timestamp make clear the timing of the publication of research results, which works to a researcher's advantage, as they can claim the clarity and priority of their own research results.

○ As universities and other institutions try to enhance and disseminate content in their institutional repositories and help reinforce their presence in Japan and overseas, they should decide what types of content to cover intensively and comprehensively as well as whether they should be open access based on information strategies and improvement policies.

○ Currently institutional repositories are mainly used in Japan, and the needs and importance are high for Japanese documents in the systems. However, it is preferable to register at least the abstracts and keywords in English, considering that dissemination in English is important for the promotion of international distribution of information regardless of field.

(Registration of theses)

○ Theses, which are one of the important types of content to be registered in

institutional repositories, are research results of not only the degree recipients but also the graduate programs of the universities conferring the degrees. The needs to access theses are high, as they reflect the latest trends in specialised fields. To further promote the registration of theses in institutional repositories is important also in view of fulfilling the university's responsibilities of returning and explaining research results to society.

(Promotion of coordination)

○ With regard to the effects of coordination with institutional repositories, it is conceivably effective to link the repositories with researcher databases of universities as well as the researcher information in JST's J-GLOBAL.

As for GiA, the coordination between KAKEN and institutional repositories is expected to help understand and analyse the results of research supported by GiA.

(Courses of action for support)

○ National agencies need to encourage academic societies that publish journals without established copyright policies to promptly decide and announce their policies, considering the current situation in which their undefined copyright policies are preventing papers published in their journals from being registered in institutional repositories.

○ At the same time, it is necessary to enhance services that will help strengthen the information dissemination capacity and operational systems, including the active development of the NII's shared repository, and sophistication and standardisation of the functions of the institutional repository software in order to further improve and more widely establish institutional repositories and to facilitate their use by users.

5. Reinforced Coordination and Cooperation among Institutions Engaged in the Implementation of Programs Designed to Strengthen the Capacity of Scholarly Communication (NII, JST, NDL, and JSPS)

a. Purposes and Programs of Related Institutions

○ The National Institute of Informatics (NII), Japan Science and Technology Agency (JST), National Diet Library (NDL), and Japan Society for the Promotion of Science (JSPS) are the related institutions involved in the strengthening of the capacity of scholarly communication. Each of them is implementing support programs according to their own purposes.

In order to efficiently and effectively implement their measures despite limited resources, it is vital to expand and reinforce their programs through promoting the coordination, cooperation, and task sharing among the related institutions, while understanding the content and status of their programs that those related institutions are implementing.

○ The purposes and the outline of the programs of each related institution for strengthening scholarly communication are as follows:

[National Institute of Informatics (NII)]

As an inter-university research institute, the National Institute of Informatics supports the promotion of scientific research at universities. NII develops, improves, and operates state-of-the-art infrastructure for scholarly communication in order to facilitate the shared use of equipment and science materials that are useful in the educational and research activities of all the national, public, and private universities.

In cooperation with university libraries, NII implements programs related to scholarly communication, including publications and institutional repositories. [GeNii, CiNii, JAIRO, SPARC Japan, etc.]

[Japan Science and Technology Agency (JST)]

As a core institution involved in the promotion of science and technology in Japan, the Japan Science and Technology Agency comprehensively promotes the creation of knowledge that brings about innovations in Japan, and returning of research results to society and the general public.

In cooperation with specialised services, JST implements programs related to the distribution and dissemination of diverse science and technology information (articles, researchers, terminologies, patents, etc.). [J-GLOBAL, J-STAGE, Japan Link Center, etc.]

[National Diet Library (NDL)]

As the only national library in Japan, the National Diet Library exhaustively collects materials published in Japan based on the Legal Deposit System. In addition to the long-term preservation of these materials as cultural assets of the nation, NDL provides services for the Diet, administrative and judicial departments, and the general public, based on its collection.

NDL is working with related institutions in Japan and overseas to expand the

electronic library services. [NDL Search, NDL digital documents, NDL Web Archiving Project, etc.]

[Japan Society for the Promotion of Science (JSPS)]

As Japan's only fund allocation organisation for the promotion of science, the Japan Society for the Promotion of Science aims to promote the distribution of outstanding research results in order to support the promotion and popularisation of scientific research as well as to facilitate international exchange in the field of science.

JSPS implements programs to support the publication of important research results and the creation of databases through Grants-in-Aid for Scientific Research. [Grants-in-Aid for Scientific Research, Grant-in-Aid for Publication of Scientific Research Results (Scientific Periodicals, Scientific Literature, Databases)]

b. Current Status of Coordination and Cooperation among Related Institutions

(Mutual use of scientific information owned by related institutions and cooperation of integrated search functions)

○ With regard to scholarly communication, NII, JST, and NDL individually collect information according to their purposes and programs, and each of them have their own search site for accessing the information. (NII: GeNii; JST: J-GLOBAL; NDL: NDL Search)

Since the main target users are different for each institution, they are paying attention to the needs and convenience of the user as they try to enhance the functions of their search site. As they improve their search site, they are reinforcing cooperation so that they can mutually use the information owned by each institution; progress is being made in a desirable direction.

○ It should also be noted that as more and more documents are digitalised in their entirety, full-text search functions are expected to be enhanced as opposed to conventional document searches based on the metadata (including category, title, keyword) and abstracts of articles. Digitalisation of information as images may require some time because text data cannot be used for it. Nevertheless, it is important to recognise the fact that the full-text search will dramatically increase the searchability of documents.

(Task sharing and cooperation for the digitalisation of journals)

○ Concerning the strengthening of journals' capacity of international scholarly communication, JSPS, JST, and NII are sharing tasks as they implement their programs for the digitalisation of important journals. JSPS implements grant programs through "Grants-in-Aid for Publication of Scientific Research Results", JST provides a platform for the digital distribution of journals through "J-STAGE", and NII operates as "SPARC Japan" to hold seminars on the promotion of internationalisation, including digitalisation of journals.

(Other)

○ Progress is being made in the awareness and practices of coordination,

cooperation, and task sharing among the related institutions: NII and NDL share tasks related to unified catalogues for libraries, JST and NII share tasks related to digital collection and preservation of science journals, and JST, NII, and NDL cooperate in the Japan Link Center project to promote the sharing of scientific information, NII supports the establishment of institutional repositories through its own programs, and NDL is involved in digitalisation projects and collection of documents on the internet.

c. Programs to be Promoted through Coordination and Cooperation among Related Institutions

(Assignment of DOIs by Japan Link Center)

○ In order to facilitate international scholarly communication, it is essential to promote the standardisation of metadata of scientific information and its international coordination under coordination of institutions. Given this, it is considered an urgent task to introduce and start assigning DOI (Digital Object Identifier), which is being established internationally as a method of identifying scientific information.

In April 2012, the Japan Link Center was launched under the leadership of JST with cooperation from other institutions including NII and NDL. The Japan Link Center aims to promote the sharing and utilisation of scientific content by ensuring centralised control over publications and location information that are owned by related institutions in Japan. The organisation is designated as the ninth DOI-assigning institution in the world. It is important to utilise this framework to promptly get the project of assigning DOIs for Japan's scientific information under way.

○ If it is possible to set up DOIs so that they enable the distinction between the published version of articles and other versions including the author's final draft, there will likely be less resistance towards the registration of author's final drafts in institutional repositories.

(Sophistication of the electronic journal distribution functions through J-STAGE3)

○ J-STAGE3 was launched in May 2012. The design and user interface were updated, the format of the database was shifted to the international standard (XML), and the submission and review systems were improved. Academic societies have high expectations that it will be able to offer sophisticated functions. Further promotion of electronic journals in Japan and popularisation of the platform in other countries are also important challenges. As a platform for electronic journals developed in Japan, J-STAGE3 is expected to enhance the programs for reinforcing scholarly communication, while continuing to maintain close cooperation with related institutions and the Science Council of Japan.

(Promotion of internationalisation by information sharing through SPARC Japan)

○ With cooperation from SPARC US and SPARC Europe, NII has been engaged in promotion activities through SPARC Japan in various formats including seminars concerning journal digitalisation, open access, and other useful information in light

of the national and international trends. These activities should be improved, expanded, and widely publicised as they are greatly important as a platform for raising the awareness of academic societies and university libraries and for sharing information.

(Further coordination of data and services among related institutions)

- It is obviously important for each related institution to promote the collection and dissemination of content according to their purposes through various measures, such as promoting digitalisation and simplifying procedures. Additionally, it is important that, through the coordination of data and services among related institutions, they achieve "standardisation" of metadata, article identification methods, and author information, along with the reinforcement of the "integrated search function" that facilitates access to more in-depth scientific information, such as the entire text of articles, as well as the enhancement of the "analysis tools and statistics functions" to capture usage data and perform other tasks.

6. Other

- Concerning the dissemination and sharing of research results, expressions of results and formats of information are more and more diversified; increasingly more data is distributed in non-text, multimedia formats, such as image data and video data. Changes are also seen in electronic journals, such as the accumulation of diagrams and data other than the body of articles, links to external databases, and the use of videos. These changes call for reinforced support for non-text scientific information.

- As for paper-based journals, information about the collection status of university libraries across the nation has been jointly established and widely used, but such information for electronic journals has not been shared because of the complicated contract requirements and availability status. It is also necessary to further the continuous collection and analysis of statistics on the availability and usage status of electronic journals at each university library in order to make appropriate contracts according to the user's needs.

- Future discussion topics for the Working Group may include the distribution of big data facilitated by academic cloud and other technological innovations, and a discussion of how the scientific information infrastructure should be improved in light of the development and use of a nation-wide knowledge infrastructure.

Glossary

DOI

DOI stands for Digital Object Identifier. It is an international identifier assigned to the electronic data of each set of content. A DOI is expressed in a combination of a DOI-prefix, which is unique to each institution, and a DOI-suffix, which specifies individual content, with a slash (/) in between. DOIs can be assigned not only in the unit of a booklet or article but also in more detailed levels such as diagrams and pages.

DRF

DRF stands for Digital Repository Federation. It is a broad community organisation whose objective is to promote the sharing of information on institutional repositories among universities and research institutions. Commissioned by the National Institute of Informatics (NII), DRF performs activities designed to facilitate international cooperation and information sharing concerning the establishment of institutional repositories and the idea of open access.

JAIRO (Japanese Institutional Repositories Online)

JAIRO is an institutional repository portal operated by the National Institute of Informatics (NII). It collects the metadata of the education and research results information accumulated in institutional repositories in Japan, and provides a search system, as well as statistical information.

JAIRO Cloud (shared repository service)

JAIRO Cloud is a shared repository service for supporting the operation of institutional repositories in which NII provides a system environment for institutions that lack resources for developing and operating their own institutional repository.

J-GLOBAL (JST General Link Center of Basis for All STI)

J-GLOBAL is a comprehensive search site for science and technology information established and operated by the Japan Science and Technology Agency (JST). Through cooperation with specialised databases, J-GLOBAL provides search functions that link together pieces of basic information such as researchers, documents, patents, and universities/research institutions.

J-STAGE (Japan Science and Technology Information Aggregator, Electronic)

J-STAGE is a system established and operated by the Japan Science and Technology Agency (JST) for the purpose of supporting the publication of and access to electronic journals published by academic societies. Starting in fiscal 1999, JST has made available a system necessary for the publication of electronic journals in an effort to support academic societies' information dissemination functions. Academic societies can use the system to publish journals.

KAKEN (Grants-in-Aid for Scientific Research Database)

KAKEN is a database of Grants-in-Aid for Scientific Research operated by the National Institute of Informatics (NII). It provides information about the adopted subjects and results of research conducted through Grants-in-Aid for Scientific

Research, which is granted by the Ministry of Education, Culture, Sports, Science and Technology as well as the Japan Society for the Promotion of Science (JSPS).

OAIster

OAIster is an institutional repository portal established and operated by OCLC (Online Computer Library Center) based in the U.S. OAIster provides a system in which the metadata of open access electronic resources around the world is collected and made available for search.

OpenDOAR

OpenDOAR is a directory site for institutional repositories operated by CRC（Centre for Research Communication) at the University of Nottingham in the U.K. It provides progress information on institutional repositories in the world, as well as the basic information about each institutional repository.

ROAT (Repository Output Assessment Tool)

ROAT is an output assessment system provided through an institutional repository project commissioned by the National Institute of Informatics (NII) and led by Chiba University. It obtains statistics on the access to the content registered in institutional repositories using uniform criteria, and standardises the output indexes.

SPARC Japan (International Scholarly Communication Initiative)

SPARC Japan is a support program implemented by the National Institute of Informatics (NII), mainly targeting English-text journals in Japan. It has supported the digitalisation of English-text journals in Japan between fiscal years 2003 and 2008. SPARC Japan aims to improve the distribution of scientific information from an international perspective. Cooperating with SPARC US, a program implemented by ARL (Association of Research Libraries) in the U.S. as well as SPARC Europe based in Europe, SPARC Japan performs consulting activities including seminars designed to help create stable business models and improve the capacity to develop international businesses.

XML

XML is an acronym for eXtensible Markup Language. It refers to the specifications of document or data description defined by a web standards body called W3C (World Wide Web Consortium). XML is being used for general purposes in the creation of electronic journals and the distribution of metadata in the world. With XML, it is easy to define the semantics and associations of documents or data within articles, and as far as science journals are concerned, XML helps improve the services electronic journals offer, such as search functions and links.

Archive

In this summary, an archive refers to a data processing system capable of permanently storing electronic documents (printing plates for paper publications that are saved as electronic files, as well as documents that are electronic at the time of creation), or an electronic file that is stored in the data processing system.

Academic Cloud

Academic cloud refers to a cloud environment that provides researchers at universities and institutions across the nation with convenient online access to a diverse range of scientifically useful resources including data, information, and research documents. It allows researchers to use the latest "data science" approach to obtain scientifically and socially meaningful research results.

Impact Factor (IF)

Impact factor is a measure for comparing the journals registered in Thomson Reuters' database using the number of citations to the articles published in each journal. The impact factor of a given journal P in year X is calculated as follows:

(The number of times the articles published in Journal P in Year X-2 and X-1 were cited in Year X)/(The number of articles published in Journal P in Year X-2 and X-1) Impact factor is used as one of the criteria for journals.

Embargo

In this summary, an embargo refers to a period of time between the publication of a journal and when free access is granted to the entire body of articles (full text) in the journal. Some journals provide open access upon the elapse of an embargo period.

Open Access

Open access means to make scientific information available and accessible on the internet for free with minimum technical and legal restrictions. Open access is an idea conceived in response to a situation in the 1990's where a steep price increase of journals made scientific information less accessible for researchers, who are the producers of research results. The increasing availability of the internet and electronic documents helped promote the concept of open access.

Mega Journal

A mega journal is an extremely large-scale open access journal that publishes several thousands to over ten thousand articles annually, covering a wide range of fields and domains in natural science. PLoS ONE published by PLoS (Public Library of Science) is one example. In comparison with conventional journals, mega journals have a simplified peer review process and less strict requirements for publication in order to achieve speedy and efficient distribution of their articles. Priority is given to ex-post assessment based on usage and other factors.

Institutional Repository

An institutional repository is a site on the internet where electronic intellectual products produced at a university or research institution are stored and disseminated generally for free. Researchers' voluntary registration of their papers in institutional repositories leads to reforming the scientific information distribution system. At the same time, institutional repositories play a significant role in the dissemination of education and research results by universities and institutions, self-promotion of individual institutions and researchers, ensuring the fulfilment of social responsibilities of describing educational and research activities, and

long-term preservation of intellectual products.

Cloud

An abbreviation for cloud computing. Cloud computing is a general term for technologies that enable easy access from anywhere to the accumulation of shared computing resources (networks, servers, storages, applications, and services). Users can receive services directly over a network without being conscious of the computing resources.

Journal

A journal is a medium in which researchers publish the results of their research. It is a type of publication that is published continuously under the same title, and its quality is ensured through the peer review system.

Timestamp

The timestamp is a piece of information that proves the creation and update dates of electronic documents. By informing the third party of the value created from the document and the date, the priority of the information can be checked at a later date.

Knowledge Infrastructure

Knowledge infrastructure is a concept described in the Fourth Science and Technology Basic Plan in reference to the development of research information infrastructure. The description is as follows: By "networking digital information resources, standardising data, maintaining basic information indicating the location of content, and reinforcing the functions to link information in order to promote comprehensive search across fields, structuralisation, and automation of knowledge extraction," we "establish and operate a system as a 'knowledge infrastructure' that enables an integrated search and extraction in the entire body of research information."

Big Data

Big data is a general term referring to the enormous volume of the entire body of digital data that is showing an explosive increase as our society becomes more and more information oriented. The importance of collecting and accumulating a large volume of data in an effective and efficient manner as well as creating new values using innovative scientific approaches is internationally recognised. Also, big data is more actively used in relevant research and development as well as business, primarily in Europe and the U.S.

Metadata

Metadata is a standard description of the properties of information to help systematise the information. It is a broad concept defined as "structured data about data". Bibliographic information about books and journals is a typical example of metadata. Standardisation of metadata is essential to enable a comprehensive search of articles published in journals.