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INFORMATION DISCOVERY, TECHNOLOGY, STRATEGIES

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Nuclear INFORMATION DEMOCRATIZATION

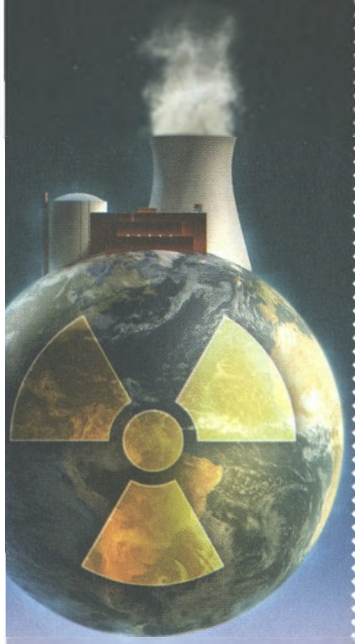
Nuclear Information Democratization

by Dobrica Savić

NUCLEAR INFORMATION (NI) INTERESTS PEOPLE FOR MANY REASONS, with energy supply, safety, and security being at the top of the list. Democratizing nuclear information has its roots in the growth of a knowledge-based economy, the knowledge worker as a user of nuclear information, developments in information and communication technologies (ICT), and the impact of internet growth. Results of democratization are apparent in the process of information creation, in how nuclear information is distributed and accessed, and in the conditions for using the information found. The International Nuclear Information System (INIS) both reflects and contributes to these trends.

Nuclear information falls under the overall umbrella of scientific and technical information (STI). It is highly specialized, but it follows general principles and trends of STI. The world of STI has its own culture and its own long-established rules of use and existence. These have brought us many inventions and improvements, introduced important technological changes, and made our lives and work much easier and more pleasurable. However, the world is constantly changing, and the traditional closed STI environment, including the world of nuclear information, is not keeping up with today's changes.

The peer-review system established to control the quality of published articles in journals is too rigid for the new opportunities offered by today's web-based comments, blogs, and social network-based evaluations.



DEMOCRATIZATION

The democratization of many activities, both social and professional, has not made a significant impact on the world of STI and NI. This is particularly evident in the traditional ways and forms of creating, distributing, accessing, and using information. Both STI and NI are still operating with an old paradigm. However, free and uninhibited access to nuclear information and to the results of scientific research and technological advancements are necessary for the world to overcome its current challenges and problems.

Accenture's 2010 report on reforming the information paradigm ("Future Information Management Trends: Information 2015—Reforming the Paradigm"; accenture.com/us-en/Pages/insight-information-2015-reforming-paradigm-summary.aspx) emphasizes openness as one of the main drivers of future information. Accenture also sees a need to balance openness and security, master radical transparency, and support open innovation and collaborative value creation. These are the major indicators of information democratization.

As is the case with other social and economic changes, the overall factors that can be regarded as instrumental in creating a need for the democratization of nuclear information are, first, a knowledge-based economy and the knowledge worker as a user of nuclear information, and, second, developments in the area of ICT, particularly the impact of internet growth.

Knowledge workers with new and very dynamic demands for nuclear information, coupled with emerging ICT possibilities, created strong demand for the democratization of nuclear information. There are at least three major areas where the democratization of nuclear information is taking place—the process of information creation, the ways and means for distributing and accessing these valuable resources, and the conditions for using the information found.

NUCLEAR INFORMATION CREATION

The creation of nuclear information is the starting point in the process of democratization. Overcommercialization of information can negatively impact the safety and security of running various nuclear facilities and projects. Knowledge can now easily be codified and reduced to information transmitted around the world at relatively low cost. As a commodity, diffusion of knowledge is directly impacted, either positively through accelerated information exchange or negatively through limiting the access via high prices.

It is not only overcommercialization. Nuclear science has also barricaded itself behind walls of official titles, such as professor, assistant, researcher, or official academic degrees. At the same time, valuable scientific and technical research and development is being performed by engineers, technicians, students, amateurs, and enthusiasts. Results of their work and research are often disregarded as not scientific enough and are omitted from the mainstream of scientific nuclear information. In addition, the use of social networking and collaboration tools is not regarded as sufficiently appropriate for scientific environments. The value of social networks for scientists lies in faster access to the information relevant to their research and in the enhanced networking communities made available by new tools, according to bioscience consulting group Comprendia (comprendia.com/2012/03/12/what-is-a-scientific-social-network-6-examples).

Democratized nuclear science creation needs to open its doors to everyone who devotes time and energy to these activities. The same applies for publishing the results of such findings. Unless coming from a prestigious university, publishing attempts are more or less disregarded by leading scientific and technical journals. Open access journals, such as those listed in the Directory of Open Access Journals (doaj.org), are slowly gaining ground, but they have a long way to go. The peer-review system established to control the quality of published articles in journals is too rigid for the new opportunities offered by today's web-based comments, blogs, and social network-based evaluations.

DISTRIBUTION AND ACCESS

Nuclear information distribution and access also contains high potential for democratization. It requires freedom of access to information and worldwide knowledge, particularly for educational purposes, and reliable and unbiased sources of information. Greater use of open access journals for publishing purposes, instead of commercial

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journals, can also make a major impact on the democratization of distribution and access.

The increased use of web publishing will be a major catalyst for this change. The number of new publishers starting up as open access publishers is increasing. The Public Library of Science (PLOS; plos.org) is a well-known example. Similar trends are found in the opening of commercial science databases to the general public through free distribution channels or through the use of aggregators such as World Wide Science (worldwidescience.org), regarded by many as a global science gateway. Some commercial publishers, such as Springer, Elsevier, and John Wiley & Sons, Inc., offer open access options.

USING NUCLEAR INFORMATION

Conditions for using nuclear information is the third area that needs to undergo some major reorganization and democratization. The current system of copyrights, licenses, patents, and trademarks is counterproductive and dysfunctional from the perspective of a global society and its long-term well-being.

Even creators of some intellectual property are not always in the most favorable position. For example, the copyright of a published article does not remain with the authors; it is waived and transferred to the article's publisher. Thus, society at large pays twice for the same work. In the case of academic work, a society initially pays through the grants given to the researchers to do the research and then later pays again through subscriptions to journals or through the purchase of published articles.

This area is probably the most difficult to change and democratize, because it involves the dismantling of some fortified publishers' privileges and benefits. New models are emerging, such as Creative Commons (creativecommons.org) or the GNU General Public License (GPL; gnu.org/licenses/gpl.html) in the area of software publishing. They are gaining ground and could be applied in almost any other area.

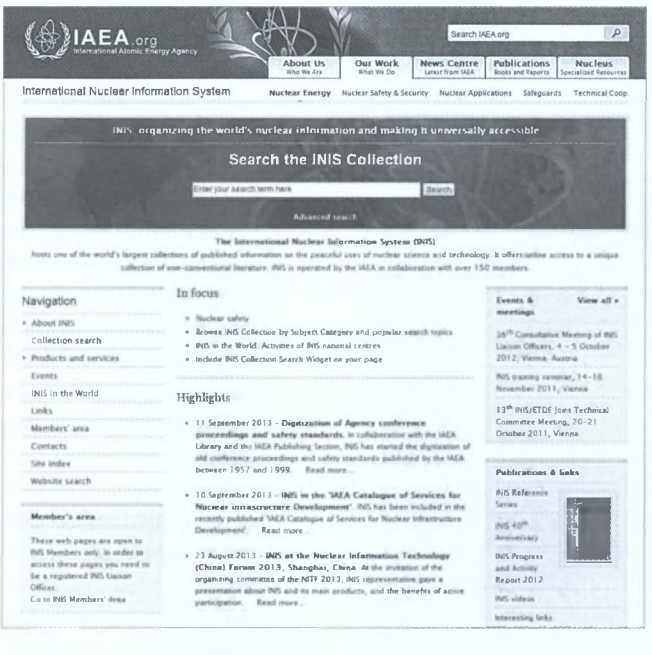
INTERNATIONAL NUCLEAR INFORMATION SYSTEM

INIS has kept democratization of nuclear information at its forefront since it began in 1970. The Statute of the International Atomic Energy Agency (IAEA, 1956), Article III, states that the agency is authorized to foster the exchange of STI on peaceful uses of atomic energy. Article VIII, which is devoted to the exchange of information, states that the agency's goal is to foster the exchange of scientific and technical information on the peaceful uses of atomic energy, to encourage the exchange among its members of information relating to the nature and peaceful uses of atomic energy, and that it shall serve as an intermediary among its members for this purpose.

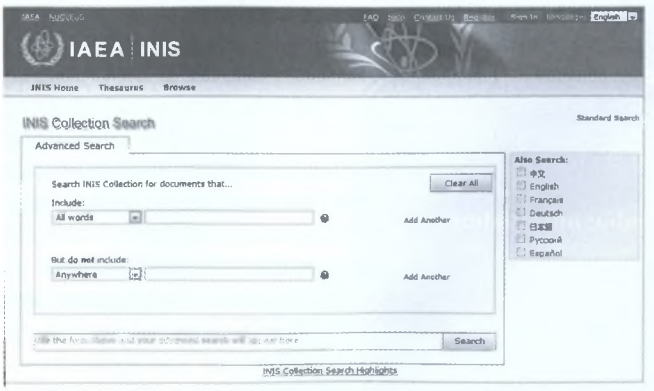
INIS provides computerized access to a comprehensive collection of references to the world's nuclear literature. It was designed as an international cooperative venture, requiring the active participation of its members. While it started with only 25 members, today there are 152 (128 countries and 24 international organizations; iaea.org/inis).

The INIS working concept was first suggested in 1965 by two consultants, one from the USSR and one from the U.S., who advised the IAEA on an outline plan for an international nuclear information system. The concept was adopted in principle by an international meeting of experts in 1966 and further developed by the INIS study team in 1968. It was approved by the IAEA's board of governors in February 1969 (Zheludev & Groenewegen, 1978). The world's first truly international computerized information system was born.

Under the INIS concept, each participating member undertakes to look through literature published within its boundaries and select those documents that fall within the agreed subject scope. The countries prepare a detailed description of each item selected and send it, in some cases together with a



The INIS homepage shows a simple search box above recent news, upcoming events, and navigation facets.



The INIS advanced search page allows for searching in eight languages and expanded search capabilities.

REFERENCES

Accenture (2010). Information 2015: Reforming the Paradigm *goo.gl/elI0M*

Bates, Marcia J. (2005). Information and Knowledge: An Evolutionary Framework for Information Science. *Information Research*, 10(4) *informationr.net/ir/10-4/paper239*

Buckland, M.K. (1991). "Information as Thing." *Journal of the American Society for Information Science*, 42(5), 351–360.

Comprendia (2012). What Is a Scientific Social Network? 6 Thriving and Inspiring Examples *bit.ly/yNMcLY*

Houghton, John and Sheehan, Peter (2000). *A Primer on the Knowledge Economy* *vuir.vu.edu.au/59*

IAEA (1956). The Statute of the IAEA *iaea.org/About/statute.html*

INIS (2000). Definition of Membership Arrangements for INIS. GOV/INF/2000/21. 2000-09-05.

INIS (2010). *The International Nuclear Information System (INIS): The First Forty Years.* Prepared by C. Todeschini. October 2010. *goo.gl/w7hUV*

Madden, A.D. (2004). "Evolution and Information." *Journal of Documentation*, 60(1): 9–23.

Wikipedia: Information. *en.wikipedia.org/wiki/Information*

Zheludev, Ivan S. and Groenewegen, Hans W. (1978). *IAEA Bulletin*, 20(4): 7–17.

copy of the document, to the IAEA in Vienna. Here, the incoming information is checked and combined with input from other countries into a single database collection.

ROLES OF INIS

INIS fulfills four separate but interdependent roles in managing international nuclear information that also play a significant role in the democratization of the nuclear information (INIS, 2010):

- At the "political" level, INIS is proof that, in an area of human endeavor as sophisticated as nuclear science and technology, countries from diverse political, social, economic, and cultural backgrounds; from all corners of the globe; and at all levels of technical development can fruitfully cooperate and exchange information.
- At the "technical" level, INIS is a channel for information exchange that employs the very latest technology available and, thus, has proved over the decades to be instrumental in bringing cutting-edge technology to countries or geographical areas that lacked such facilities or infrastructures.
- At the "pragmatic" level, INIS is the tool used by scientists, engineers, technical people, and managers in the nuclear industry to keep abreast with developments in the subject areas covered by the INIS collection.
- From the perspective of "knowledge management and preservation," INIS is the repository for references to publications that contain the cumulative scientific knowledge in the areas of the peaceful applications of nuclear science and technology as recorded in scientific journals, as well as the repository for the full texts of nonconventional literature (NCL), also known as "gray literature," not easily available through regular commercial channels.

BENEFITS TO MEMBERS

The INIS Membership Agreement lists the benefits of INIS members—access to a comprehensive and extensive pool of information in nuclear fields; the right of every INIS member to access the relevant nuclear information of all other INIS members; increased access to, and visibility of, a country's national nuclear-related literature; technical cooperation and assistance in establishing and improving National INIS Centers; and help with the transfer of modern information technology and know-how to member states. It is remarkable that these goals and benefits, based on highly democratic values, were introduced at the very beginning of INIS' existence and still remain valid.

INIS represents an extraordinary example of world cooperation where 152 members give access to their valuable nuclear information resources in order to preserve world peace and further increase the use of nuclear energy for peaceful purposes. Not only are more than 3.4 million bibliographic references to publications, documents, technical reports, noncopyrighted documentation, and other gray literature made available, but 350,000 full texts are also available. Besides being a source of information for searching, availability of full text gives INIS a special role—being a main custodian of this world information heritage and preserving this codified specialized scientific and technical knowledge.

Since its inception, INIS operated in a controlled environment where users need to register through their national INIS center, as well as the INIS Secretariat headquarters in Vienna before being given access to the collection. This changed in 2009. Now INIS gives free, open, and unrestricted access to the database to all internet users around the world. This initiative provided easy access to reliable nuclear information on the peaceful uses of nuclear science and technology, including nonconventional literature, and made nuclear knowledge readily available worldwide. After opening this collection, the number of users doubled.

Another advance in the popularization of INIS and the democratization of its nuclear information collection was the introduction of a new public distribution channel. INIS joined the World Wide Science Organization and made its database searchable through the web portal. This action further increased the number of INIS database searches, improved its presence in the world of science, and increased its usefulness to the scientific and technical community.

IMPROVING ACCESS

Democratization also needs to take into consideration geographic location, national

diversity, and users' language preferences. Great efforts were made to improve the accessibility and friendliness of the INIS Collection search (inis.iaea.org/search). The INIS/ETDE Thesaurus was incorporated, offering search descriptors in eight different languages (Arabic, Chinese, English, French, German, Japanese, Russian, and Spanish). A multilingual user interface and help files were introduced, covering the same eight languages. A search results page now offers better readability and an option to translate the bibliographic records into other languages using Google Translate.

In 2012, the INIS Unit and the IAEA Library merged to create the Nuclear Information Section (NIS). Existing information products and services were enhanced and new ones introduced. As a result, the bibliographic records from the IAEA Library catalogue were successfully incorporated into the INIS Collection. More than 90,000 IAEA Library bibliographic records were added to the INIS Collection Search. This enabled a simplified and more efficient single access point to both the INIS and IAEA Library collections through the INIS Collection Search web interface.

In addition to the enlarged collection, nuclear information users gained a complete view of the IAEA Library collection holdings and access to bibliographic records of its books, technical reports, and other documents collected over a period of 50 years. This year, the IAEA Meetings on Atomic Energy (MoAE) database was added to the INIS search as well. Aggregation of partial and segregated information collections or portals by combining them into a functional and easy-to-search resource represents another step toward empowering nuclear information users. This "single access point" approach to information search and retrieval saves time and effort on the side of potential users and gives them better opportunity to find the actual information they are looking for.

FUTURE NUCLEAR INFORMATION DEMOCRATIZATION ACTIVITIES

Future democratization of nuclear information brings another challenge—of going from open access to a fully implemented open data concept. INIS opened its collection to the world, making it freely available over the internet. There are no restrictions imposed on the users, and a complete collection, including the full text of many documents, is available for easy download.

The open data concept (opendefinition.org) calls for further democratization of information, particularly in the following three areas:

- *Availability and access:* The data must be available as a whole and at a reasonable reproduction cost, preferably by free download over the internet. The data must also be available in a convenient and modifiable form.
- *Reuse and redistribution:* The data must be provided under terms that permit reuse and redistribution including the intermixing with other datasets.
- *Universal participation:* Everyone must be able to use, reuse, and redistribute—there should be no discrimination against fields of endeavor or against persons or groups. For example, "noncommercial" restrictions that would prevent "commercial" use, or restrictions of use for certain purposes, should not be allowed.

OPEN DATA

As a consequence of applying the open data concept, a number of actions must be planned and implemented. The first and most critical one is opening the underlying database of the INIS Collection to outside programs and applications so that they have access to the raw data. This access could be achieved by making the INIS Collection compliant to the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH), an application-independent interoperability framework for metadata harvesting and building of repositories.

The next step would be giving direct access to the individual records in the collection or to the data subsets. All this can be combined with the creation and use of independent outside-based APIs.

FURTHER DEMOCRATIZATION

Further democratization developments and challenges foreseen by the INIS Secretariat include increasing the number of INIS members; reaching complete world coverage; increasing members' contribution to the database, particularly the number of full-text documents; and improving the reliability, trustworthiness, accuracy, and timeliness of available information resources.

Information can be regarded as knowledge, a process, or a thing. All three facets or views of nuclear information can benefit from democratization efforts. INIS represents a good example of successful democratization on all three levels. Valuable nuclear knowledge codified in 3.5 million information resources was collected in a collaborative and fully democratic manner among 152 INIS members, and it was made freely and openly available to the world through the internet—the cheapest and most effective tool for modern information dissemination, retrieval, and use. This collected corpus of nuclear information is preserved as the world's nuclear scientific and technical heritage for current and future researchers interested in the topic.

Democratization of nuclear information is not a static goal. It is a process whereby information technology and modern information management practices are combined to bring maximum benefits to end users by making the information easily accessible and freely and openly usable.

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