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Improving Human Welfare: The Crucial Role of Open Access

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Knowledge [is] not the personal property of its discoverer, but the common property of all.

Benjamin Franklin

Developing countries are increasingly improving their capacity to use scientific and technical knowledge to solve local problems. They are investing in communication infrastructure and improving technology policies. For such measures to be effective, those countries also need greater access to the world's pool of knowledge.

Restrictions on access to scientific and health information are hindering progress, particularly in the world's least-developed countries, and are impeding efforts toward global development. Essential information is locked away behind such barriers as journal subscription charges or individual article download fees. Journal articles are typically subject to restrictive copyright licenses that prevent reproduction, distribution, translation, or the creation of derivative works, all of which would help published work to be used for innovation. These restrictions are compounded by infrastructure inadequacies and lack of incentives for increasing the use of scientific and technologic knowledge in solving challenges in developing countries.

Expanding the “Knowledge Commons”

One mechanism for improving human welfare in developing countries is to expand the amount of essential information that is in the public domain, that is, to expand the “knowledge commons”. Such expansion would give health workers and policy-makers access to crucial information to guide their practice; it would also give countries the technical knowledge needed to solve fundamental challenges, manage the environment, and participate in international trade.

The development of the Cuban health-care system, for example, relied heavily on the use of scientific and technical information, much of which was translated from other languages. Access to scientific information was complemented by the creation of health research and training institutes.¹ Other countries, such as Jamaica, have emulated the Cuban model and have made improvements in health care.

Another remarkable example of the use of publicly available information was the so-called Green Revolution that helped such countries as Mexico and India become self-sufficient in food production. The Green Revolution relied heavily on the results of plant-breeding programs in industrialized countries. But the publicly available knowledge could be put to practical use only through the creation of local research institutions, such as the International Maize and Wheat Improvement Center in Mexico and the International Rice Research Institute in the Philippines. With adequate access to scientific knowledge, health-related universities and national research institutes in developing countries can mirror those successful initiatives.

The knowledge commons is thus a critical foundation from which innovation develops. The well-established practice of providing an expiry date for intellectual-property rights, after which knowledge becomes publicly shared, is an illustration of the importance that society has historically attached to the role of the knowledge commons. Every year, the expiration of thousands of patents brings into the public domain new knowledge that had been available only on royalty payment. That knowledge constitutes an important reservoir of ideas that can be used to meet development needs.

Unlocking Scientific and Medical Knowledge

Scientific and medical research articles—a treasury of medical and scientific knowledge—should surely be part of the knowledge commons. For the scientific and technologic communities, open-access publishing unleashes full-text literature into a single information space (open-access articles are immediately archived into full-text public repositories, such as PubMed Central). Unrestricted access to repositories of scientific data, such as genetic and molecular information, has revolutionized life-science research in recent years and has helped to establish new fields, such as proteomics and genomics.

An example of this revolution is GenBank (www.ncbi.nih.gov/Genbank), a public database of DNA sequences that is freely accessible to all scientists without restrictions. Academic institutions and commercial companies worldwide—in developed and developing countries—are licensed to use the database for product development. Open access to the broader scientific and health literature will have equally profound benefits for research on challenges faced by developing countries.

Inadequate attention has been paid to the benefits of expanding the uses of the knowledge commons. Inventors and innovators are increasingly interested in making their ideas available free of royalty for use in meeting the needs of developing countries. Some institutions, such as the Nairobi-based African Agricultural Technology Foundation, are focusing on making proprietary technologies available royalty-free for developing new technologies for small-scale farmers. Such systems extend the open-access ethos to technologic information and help to broaden the space for human creativity.²

In another variant of the drive to promote access to core technologies, the Biological Innovation for Open Society (BiOS) project extends the open-source software concept to the life sciences with an emphasis on finding solutions for challenges of the developing world. The BiOS project will free up the rights to patented DNA sequences and the methods needed to manipulate biologic material. As with open-source software, open-source biology users own the patents on their creations but cannot hinder others from using the original shared information to develop similar products.

An equivalent revolution is taking place in medical and scientific publishing. A growing number of open-access publishers not only make information free, but publish it under innovative copyright licenses, such as the Creative Commons licenses (creativecommons.org/), which allow readers to use the results of research in innovative ways. With those licenses, authors grant the public the right to use published work for any legal purpose, provided that they cite the source and credit the author; the only limit is the reader's (user's) imagination. Such licenses maximize the usefulness, impact, and value of the literature. For example, African health ministers are licensed to make millions of copies of the report of the first randomized trial of circumcision for HIV prevention,³ to give a copy to every health professional in their country, to translate it into local languages without restrictions, or to create locally relevant derivative articles. Those examples of “open access” and “open source” illustrate the growing interest in expanding the space for creativity by promoting flexible intellectual-property systems that seek to balance public and private interests.⁴

Sharing Ideas Leads to More Ideas

The main concerns of developing countries are related to having the capacity to access knowledge and building institutions that convert knowledge into goods and services, such as public-health care and education. Once the entire scientific and medical literature becomes truly open, there will be new opportunities for collaboration between developed and developing countries. For example, the free availability of data was crucial to the success of the Human Genome Project, in which scientists from the developed and developing worlds worked together for the public good. Unfortunately, scientists, physicians, and policy-makers in resource-poor countries are largely excluded from the “scientific conversation”, in that they are not able to afford access to the knowledge base that is necessary for an equal exchange of ideas.

Developing countries are starting to recognize the importance of reliable communication infrastructure. Rwanda, for example, is modernizing its communication capabilities by extending fiber-optics cable to key centers in the country. Jamaica is laying fiber-optics cable around the island. Those

investments not only will help the countries to expand their international connectivity, but will specifically strengthen access to the global body of scientific knowledge.

In addition to infrastructure investment, developing countries are creating new institutions and policies aimed at increasing the application of science and technology in development. President Paul Kagame of Rwanda, for example, has created a ministry of science and technology in the presidency to facilitate the integration of science and technology in all aspects of development and human welfare. Access to scientific and technical literature will be critical to the implementation of the country's policies.

International Momentum toward Open Access

There is growing momentum in making global open access a reality, and thus in opening a new realm to people in developing countries. The Wellcome Trust mandates open access to publications that result from research that it funds.⁵ In the United States, the National Institutes of Health requests that its grantees make their research results publicly available.⁶ The United Nations has formally championed open-access publishing as a global development tool,² and more than 130 scientific organizations have signed the Berlin Declaration on Open Access.⁷ The list of signatories includes many people in low- and middle-income countries, such as Lu Yongxiang, president of the Chinese Academy of Sciences, and M S Valiathan, president of the Indian National Science Academy.

At last year's 9th World Congress on Health Information and Libraries in Brazil, developing-country participants published the *Salvador Declaration on Open Access: the developing world perspective*. The declaration states: "We call on all stakeholders in the international community to work together to ensure that scientific information is openly accessible and freely available to all, forever."⁸ For the full participation of all developing-country researchers in the scientific and medical research enterprise, the international community must heed that call and ensure that the "digital divide" is replaced by a multidirectional global flow of information and knowledge.

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