Science in the Information Society

Science and development

Publicly funded science has a central role to play in the development of the Information Society. Many of the fundamental technological components of the Information Society were discovered or invented in academic laboratories: electricity, radio waves, the laser, the transistor, the World Wide Web (www), the web browser. The next breakthroughs are already in the pipeline, with Grid computing – a new form of distributed computing that involves coordinating and sharing computing power - being piloted by the scientific community. Even more important however, is the role that scientific knowledge plays as a driving force for social and economic development. The new information and communication technologies (ICTs) provide a unique opportunity to ensure universal and equitable access to scientific data and information, which would be a very major step in enabling all countries to achieve their development goals.

Possible quote to be highlighted in box:
"Recent advances in information technology, genetics and biotechnology hold extraordinary prospects for individual well-being and humankind as a whole." Kofi Annan (Science, 7 March 2003)

Science and the information divide

The advancement of science is absolutely dependent on the provision, analysis and dissemination of data and information. ICTs are revolutionising the practice of science and vice versa. The www arose out of the needs of particle physicists to share and analyse large amounts of data. The sequencing of the human genome would not have been possible without the rapid development of bioinformatics and the sharing of databases across the world. Much of science is now conducted virtually and there should be no reason why any scientist anywhere in the world, who is equipped with a PC and reasonable internet access, cannot make a significant contribution to scientific progress. However the reality is that, even where the hardware is available, scientific data and information in many areas are not universally and openly accessible. IPR regimes, database protection legislation, and the cost of some scientific journals are all contributing to a very significant knowledge divide in science.

Universal and equitable access to scientific knowledge

Strengthening the public domain for science and ensuring free and open access to scientific data and information are essential steps in the construction of an equitable information society. Access is dependent on infrastructure: ensuring that all universities and research institutions have affordable and reliable high speed internet connections within the next 5 years is a crucial and realisable target that the Summit should strongly endorse. Further to this, it is important to ensure the strengthening and enhancing of existing communications infrastructures to provide affordable access for all communities of scientific information users.

However, infrastructure alone cannot bridge the divide in access to scientific knowledge. International and national action plans must focus on human and institutional capacity building. Educational and research institutions and others with expertise in ICT applications need to work together to develop training facilities, including specialist training in open access approaches to information management. It is also very important to strengthen the

successful and innovative programmes that have already been implemented to promote equitable access to scientific information in developing countries.

Decision-making and governance

Science plays a crucial role in identifying and analyzing the many challenges faced by society, and in generating the knowledge to respond appropriately. Thus, reliable scientific data and information are essential to support good decision-making and policy development. This information is even more useful when it can be combined with other knowledge from other sources; indeed, ICTs are transforming governance at many levels by facilitating the involvement of more actors.

In order to have reliable evidence base for decision-making, it is necessary to ensure long-term support in all countries for the collection of scientific data. In many areas, particularly those relating to environmental change or public health, long-term monitoring is essential to produce a useful data set. Critical data-sets need to be established, maintained, updated, and made widely available.

There is a need to carry out further research and development on new and more inclusive governance mechanisms at local, national, and international levels for the information society. ICTs provide new opportunities to include all stakeholders, including people from the communities directly affected, in policy formation and problem management. Effective and efficient strategies for participatory research and decision-making should be identified and developed. The role of the media as a critical and objective bridge between scientists, decision-makers and the public needs to be nurtured.

Policy issues for scientific information

Established policies relating to scientific information focus almost exclusively on enhanced protection of proprietary information, leaving the role of public domain information poorly addressed. In order to derive the greatest possible social and economic return on public investment and stimulate scientific progress, the science community, in collaboration with relevant institutions and national governments, must redress this balance.

It is in the interests of society as a whole that our governments adopt policies to ensure that data produced from publicly funded research remains openly available to the largest extent possible. Open availability of scientific data avoids unnecessary duplication of effort, maximizes the return on public investment, promotes verification of research results, and stimulates scientific progress. Scientific data produced with public funding should normally be made available at no more than the marginal cost of dissemination and with no restrictions. Where necessary, restrictions on proprietary data and information should be designed to maximise availability for academic research and teaching purposes.

Scientists should be involved, as major stakeholders in the information society, in the discussion and development of intellectual property rights and copyright legislation—at both the national and international level

Improving education and training

Despite inequalities in access, an ever-increasing amount of scientific information is openly available. Yet, without education and training on how to access and utilize it effectively, the potential benefits for society as a whole will not be realized.

Further research into ICT-supported learning is vital. Science educators must understand how the use of ICTs relates to the learning capabilities of children. They should also recognize the importance of imparting how scientific knowledge is produced and how it differs from other types of information. Both students and the general public need to develop the skills to discriminate between scientific information of variable quality. Scientific literacy will be an increasingly valuable asset in the information society.

ICTs can help the sharing of educational resources through the provision of open courseware that is freely available online to researchers, teachers, and students. Open distance learning, as well as global virtual libraries and laboratories, can be used to support scientific research and education worldwide. However, one feature of the www that needs to be guarded against is the routine loss of information. Educational ICT materials must be archived to ensure that best practices are safeguarded and that valuable resources are available over long periods of time.

Beyond Geneva

It is to be hoped that the first phase of the WSIS in Geneva will mark the first step towards a more universal and equitable Information and Knowledge Society. Science and scientists have a crucial role to play in the development of this society and we fully recognize the need to engage with all other stakeholders to ensure that what develops is truly to the benefit of the global community to which we all belong.

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In March 2003, the International Council for Science (ICSU) in cooperation with its Committee on Data for Science and Technology (CODATA) and UNESCO organised an on-line forum and workshop bringing together more than 60 leading scientists and representatives of international organisations. These experts drew up an agenda for action entitled 'Science in the Information Society' that has subsequently been formally endorsed by many national science academies from both the developed and developing world and by numerous international science bodies.

Agenda for Action

1. Ensure that all universities and research institutions have affordable and reliable high-speed Internet connections to support their critical role in information and knowledge production, education and training.

2. Promote sustainable capacity building and education initiatives to ensure that all countries can benefit from the new opportunities offered by information and communication technologies (ICTs) for the production and sharing of scientific information and data.

3. Ensure that any legislation on database protection guarantees full and open access to data created with public funding. In addition, restrictions on proprietary data should be designed to maximise availability for academic research and teaching purposes.

4. Promote interoperability principles and metadata standards to facilitate cooperation and effective use of collected information and data.

5. Provide long-term support for the systematic collection, preservation, and provision of essential digital data in all countries.

6. Promote electronic publishing, differential pricing schemes, and appropriate open source initiatives to make scientific information accessible on an equitable basis.

7. Encourage initiatives to increase scientific literacy and awareness of how to interpret web-based scientific information.

8. Support urgently needed research on the use of information technologies in key areas, such as geographical information systems and telemedicine, and on the socio-economic value of public domain information and open access systems.

9. Recognise the important role for science in developing and implementing the new governance mechanisms that are necessary in the information society.