Box 10.9 Free softwares and Open Source

The expansion of "Open Source" (literally "with an open source code") and free softwares, has seen the apparition of new ways of creating and sharing knowledge. A software is said to be "open source" when its source code and the basic elements of its conception are accessible to all, as opposed to the "proprietary" software that was the norm up to now and whose source code is not accessible, considered secret and hence closed. This model of development said "proprietary" is based on the separation of the respective domains of competence between the designer and the user of the software. The great transformation introduced by free and "open source" softwares is the sharing of the source code that allows its study, its revision and its improvement through an iterative process. Anyone familiar with computer programming can then study the source code of a given software and correct it or improve it him- or herself, or in collaboration with others. He or she can then propose and discuss the modification of the software with other developers and users of the software within a sharing community. If the modification is accepted by the community, the modified and improved software becomes the new reference version, which is of better quality and shared by the whole community. Free and "open source" softwares are thus a new way of envisaging innovation as a decentralized and collective enterprise. Furthermore, the sharing dimension of the process of development allows a novel and efficient type of collaboration and collective learning. One of the factors of success of the model lies in the efficient division of the cognitive work that enables all the stakeholders to concentrate on the domains that interest them and for which they have specific competences.

The sudden rise of free and "open source" softwares introduces not only a model of development but also a new economic model, for there is no need any longer for expensive investments in R&D or patenting. That is why it has already been adopted in most associative projects related to the internet, in the form of free open and modifiable programmes (free software).

Generally speaking, the model of development of free and "open source" software can represent a promising track to limit the effects of the definition of restrictive (or closed) standards and for their appropriation in knowledge societies. As we have seen, it is to be feared that the normalization of formats can lead to the production of closed standards (as opposed to the concept of open standards) for the processing of contents, which runs counter to the aim of making the new technologies a space of freedom and of increased potential. Standardization must not be assimilated to homogenization but rather to a quest for a balance between the need to favour creativity and cultural liberties on the one hand, and the imperative of a common code on the other. The model of development of free softwares shows that the problem of homogenization does not lie in the common or even universal nature of codes in force but rather in the way they are designed. It does not oppose standardization and lack of standards, but rather open standards and closed standards. To be really useful, a standard must be accessible to the rest of world and be free of any clause that could limit its use.

Knowledge and power in technical democracies

Knowledge has not only become one of the keys to economic development; it also contributes to human development and individual empowerment. In this sense, knowledge is a source of power because it creates a capacity for action. The slow emergence of knowledge societies has thus led to an unprecedented extension of individual capacity for acting in modern societies, which is in particular exercised within the framework of democratic institutions open to the participation of all. Since the beginnings of democracy in Athens, capacity has been a constituent part of citizenship. Participation in elections, whether based on the payment of a poll tax or in a more or less democratic framework, has always depended on the precondition of capacity, whose definition has considerably changed over time and in accordance with historical circumstances.[23] Universal suffrage only became an effective democratic reality with the spread of education for all and the fixing of an age of majority when men and women acquire the right to vote and gain full possession of their citizenship, subject to the existence of free and independent media. Knowledge indeed is a necessary condition for guiding political choices towards the common good or the general interest.

If knowledge is the condition for the *capacity* of citizens in a democratic society, then care must be taken to ensure that knowledge gaps between citizens in the same democracy do not result in the most knowledgeable of them being vested with excessive authority in public debate, and that the overlap of knowledge societies with a democratic regime does

not lead to tutelary authority being conferred on a limited number of experts specializing in public affairs. The fact is that the authority of experts is far from being always legitimate, especially when they venture outside their area of specialization and claim to exercise moral leadership in public matters that generally turn more around collective preferences and call for common sense. The suspicion that real decisions are taken outside the public sphere, reflecting in particular to the positions of powerful interest groups, and that democratic debate is no more than a purely formal practice may prove for the public to be an easy excuse for not taking an interest in politics. In knowledge societies, however, is not the spread of expertise the best way of protecting oneself not only against an abuse of power by experts but also against the force of pressure groups? For once, everyone is more or less capable of evaluating the authority of the expertise exercised by experts, the experts – become accountable to the public for the impact of their recommendations on collective decision-making.

The rise of knowledge societies could well open the way to various styles of more participatory democracy in which forms of interaction between the different actors would have a decisive influence, without calling into question the methods of selecting legislators and leaders, whose representative legitimacy remains the pillar of democratic institutions. Technical democracy is now characterized by the mixed nature of the actors brought together for the discussion of a technical or scientific matter within hybrid forums. Today, and this will be increasingly true with the rise of knowledge societies, science policy debates (on bioethics, GMOs, nanotechnologies, etc.) are unthinkable without the participation of a variety of stakeholders – including experts, politicians, non-governmental organizations, media, enterprises and citizens. Such a situation moreover encourages learning, since the public will feel itself obliged to become informed in order to take a decision, guided by the views of experts in turn subjected to the free scrutiny of citizens. Knowledge societies therefore create the possibility of democratic expertise within the framework of what political science has called *deliberative democracy*. Knowledge-sharing does indeed make for a shared horizon within which democratic discussion, the settlement of disputes and the possibility of a consensus, may emerge. Knowledge-sharing, thus, not only lends itself to the promotion of public domain knowledge or information, it also opens up a true *public arena*, a meeting place and forum for democratic deliberation, where deliberating about the means always comes down to deliberating about the ends and, ultimately, about values. What this shows is the extent to which, paradoxically, the question of the meaning of and the very prospect for utopia will remain fully relevant in knowledge societies.

In assessing the power effects of knowledge, we should not, however, underestimate the power dimension of knowledge itself or of the knowledge-sharing community. Knowledge is itself a medium for the exercise of power, for knowledge is "embedded" in the inmost core of social structures – as is illustrated, for example, by the double meaning of "collaboratory", denoting both methodology of knowledge production and model of social relations based on collaboration, sharing and cooperation. Some commentators have not failed to emphasize how much science is itself the place of power relations between members of a same knowledge-sharing community.

The promises of e-democracy and e-administration in knowledge societies

The new technological possibilities arising with the emergence of knowledge societies (which are the sign of the rapid development of a global information society) may also help to ensure new and particularly promising tools for democratic participation. Very early on, the dream of democratic participation without constraint or high transaction costs and attempts to rationalize political activity were embodied in the promise of an initially technological then electronic democracy, however it may have been represented. With the earliest computers, the cybernetic fantasy of a rational piloting of societies took shape, which also came to be embodied in planning efforts, particularly in countries with a tradition of state control.

Today, the internet and networking appear in the eyes of a number of experts to be promising instruments of a new mode of more democratic

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relations, although the lessons of history should caution us against a disproportionate cyber-optimism. Each communication revolution has given birth to lyrical illusions and utopias of integral conflictless democracy, that were soon denied by history. However, the new possibilities of electronic administration (e-administration; see Box 10.10) could contribute to the consolidation of modes of *democratic* governance, particularly in developing countries.

Will there be a renewal of democratic practices in knowledge societies?

Is it then recognized that in "connected" countries, the use of the new technologies in the field of democratic participation has really modified democratic behaviour and practices? To answer this question, it is important to see where we stand in relation to three contradictory attitudes that reflect judgements about electronic democracy – cyber-pessimism, cyber-scepticism and cyber-optimism. In fact the latter is currently the target of significant criticism, certain authors considering that the web promotes not so much a civilized space for discussion and argument a source of tolerance and openness, as a pooling of idiosyncrasies that may potentially lead to the radicalization of each person's opinions. It is undeniable the new technologies have, in a number of countries, significantly modified the nature of the "political supply", arousing new expectations in the electorate. It is noted by numerous studies that the new technologies have a positive impact on democratic participation, promoting in particular participation directed towards the defence of great causes or centred on civic engagement. As shown in Figure 10.1, in knowledge societies, use of the new technologies to gather information and form an opinion on major issues of national or worldwide interest, leads to the further development of voluntary sector *activism*, rather than to a real resurgence of conventional forms of democratic participation in the form of voting or traditional political militancy. Is not this substitution of the old contractual solidarity for a new form of solidarity based on an associational bond a striking illustration of the fact that knowledge, just as much as values, may be a reason for association? The figure also shows that correlation between democratic participation and internet use differs according to the type of participation considered.

Is it necessary to recall, in a context of global boom of the associative phenomenon, that associations are at the core of the very principle of democracy? What this suggests is that, in knowledge societies, individual empowerment and knowledge-sharing will perhaps lead to a further rise in *associational democracy* and, concurrently, to the emergence

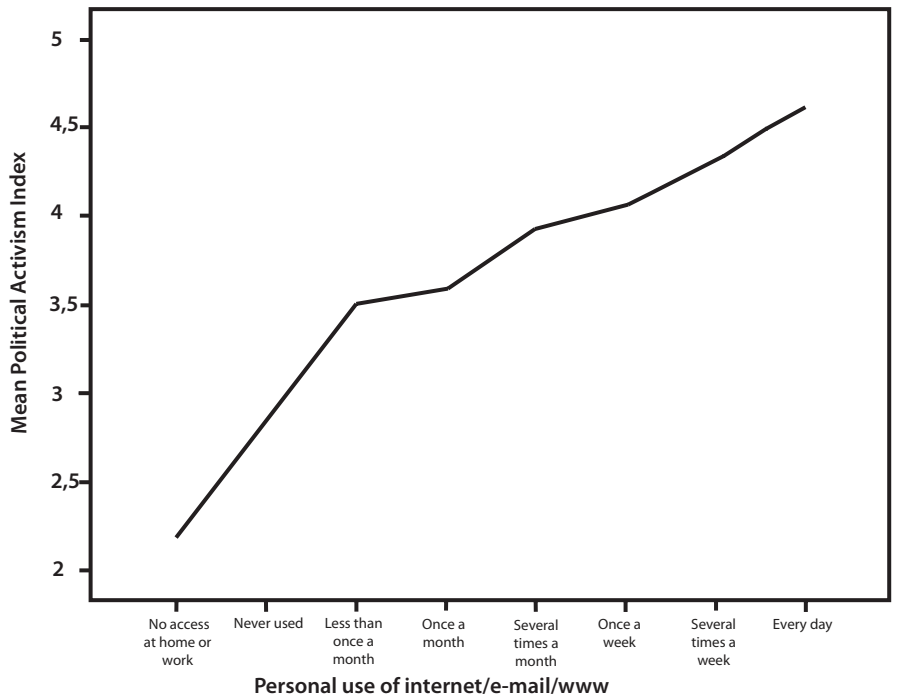
Box 10.10 E-administration in countries of the South

More often than not, the strengthening of electronic administration capacity is a result both of the growing demand of citizens for improved quality of public services and of the economic pressure of private sector operators (such as public management consultancy firms) that find a commercial advantage in it. Such models of e-administration facilitate interactions between government and citizens (G2C), between government and the business world (G2B) or between different government departments in the same state (G2G). It is interesting to note that some countries of the South, such as Chile, Brazil or India, have played a pilot role in this field and have been rewarded by remarkable gains in terms of governance or of the relationship between government and citizens. The satisfaction of citizens is considered to be illustrated by the fact that, even in countries where per capita income is rather low, they seem willing to pay a modest contribution towards keeping up the online administration service. In addition, the provision by the public authorities of public domain knowledge or information is facilitated by the solutions offered by e-administration. These are also believed to have offered a means of introducing greater transparency into the workings of the administration and indeed of combating corruption. Through the modernization that inevitably results from e-administration, this could therefore speed up the processes of democratization.

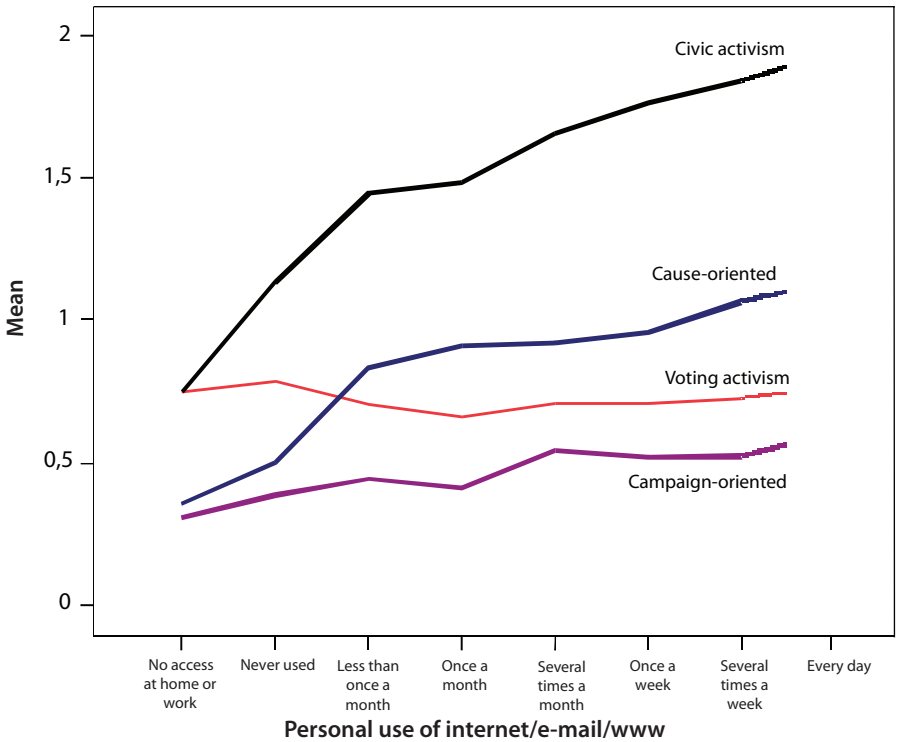
It is true that priorities will be different according to circumstances. In Africa, the priority is to ensure the long-term development of infrastructure whereas, in Asia or Latin America, efforts should focus more on site maintenance or content quality. In all cases, however, the emergence of knowledge societies seems to be raising real expectations on the part of citizens, expectations that can be met through the technical solutions offered by the world information society.

Figure 10.1 Impact of the new technologies on democratic participation in the European Union

As shown by Pippa Norris, correlation between democratic participation and Internet use...



...differs according to the type of participation considered.



Note: These data, drawn from the *European Statistical Survey*, only concern European countries.

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of a *relational individualism*, consisting in a continual negotiation with others that resembles neither liberal individualism nor the temptation of communalism. This finds its place on the narrow line that we have traced between the two dangers of false universalism and relativism.

New awareness of global risks such as climate warming or the erosion of cultural diversity, together with the advances made by the concept of sustainable development,[25] point to the emergence of a global citizenship whose mobilization potential is increased by the new technologies and the possibilities of transnational organization that they offer.[26] Knowledge societies might thus be able to succeed, where the information society has in part failed, in promoting a true sharing of meaning, a dialogue between cultures and new forms of democratic cooperation.

If it is true that the current disaffection with politics can be explained by the absence of projects in contemporary societies overtaken by indifference and a loss of interest in the common good or collective action, then the emergence of knowledge societies could well plead for a new relationship to time based on the idea of an *ethics of the future*. For knowledge, which caters for the long-time span and is itself patiently assembled over time, cannot by definition be tied to the short term. Turned towards the most ancient past and the most distant future, in a twofold cultivation of hindsight and foresight, the labour of knowledge requires the horizon of the long term, which allows us to stand back and to take a critical distance from the flood of information with which we are swamped. Not that knowledge should drive us into ivory towers. On the contrary, in knowledge societies, consideration of the long term will lead us to question more our present choices and decisions in the light of their possible consequences. Democracy in knowledge societies should then be a *future-oriented democracy*. This should be more participatory and open to universal free speech and to increased opportunities for exchange and local forums. If such a trend is confirmed, then we may legitimately hope that knowledge societies will be the context of a regeneration of forms of solidarity. For these will no longer be able to make do with defining a social contract continually renewed in the present, taking little account of future generations. What will take its place will perhaps be the form that is assumed by a contract when it is time-oriented – the joint implementation of a project.

Background resources

Azcueta (2001); Backus (2001); Barber (1998); Bourdieu (2004); Boyle (2003); Boyle (2004); Braga *et al.* (2000); Callon *et al.* (2001); Cohen (2004); Correa (2003); Delamonica *et al.* (2001); Evers (2002); Ewing (2003); Fischer (1996); Flichy (2002); Forero-Pineda and Jaramillo-Salazar (2002); Frederick (1993); Gibbons *et al.* (1994); Giddens (1986); Giddens (1990); Goetz (2001); Golding (1996); Graziano (1988); Habermas (1971); Hariharan (2004); Hugenholtz (2000); Karlsson (2002); Kaul *et al.* (1999); Knorr-Cetina (1998); Kollock (1999); Lascoumes (1999); Lessig (2001); Longworth (2000); Minges and Kelly (2002); MIT (1999); Moynihan (1998); OIT (2001); Persaud (2001); PJB Associates (2003); Poster (1997); Rivière (2003); Rodotà (1999); Sagasti (2004*b*); Sagasti (2004*c*); Salomon (2001); Sciadas (2004); Sooryamoorthy and Shrum (2004); Stehr (2004); Stiglitz (1999); Sue (2001); Sunstein (2001); Tuomi (2004); UNDP (2003 and 2004); UNESCO (2001*c*, 2003*g*, 2003*h* and 2004*a*); Vedel (2003); Viswanath and Finnegan (1996); Wade (2004*a*); Wiener (1948); World Bank (2003).

Conclusion

To conclude, let us advance a hypothesis and make a wager: what if twenty-first century societies, deeply transformed by the growth of information and communication technologies, were bound to become knowledge societies because they will be knowledge sharing societies? But how can such a relationship be established? It is important to recall that the new technologies are network technologies. Within them knowledge is a fact because the members of a single network are interdependent. In such a context, interdependence requires sharing knowledge in order to be effective. Consequently, are there still any grounds to set ethics against performance, and solidarity against efficiency? One of the major advantages of knowledge sharing is that it cuts costs by achieving economies of scale and avoiding useless duplication.

Bearing that in mind, the notion of "knowledge societies" holds out fresh possibilities for human and sustainable development because it summarizes, while standing apart from them, approaches as varied as those offered by the ideas of "information society", "knowledge-based economies", "learning societies", "risk societies" and lifelong education for all".

However, two stumbling blocks may impede the growth of knowledge-sharing societies. The first is the risk of promoting a *single model,* based exclusively on the requirements of the knowledge economy that is already prospering in the most advanced countries. This single model would widen existing divides and lead to the emergence of new forms of exclusion, not only between the most developed countries and the rest, but also within each country. True, at this point the knowledge economy merely characterizes the convergence of a set of transformations, including a rise in knowledge investments, the spread of new technologies and institutional changes fostering access to knowledge. However, in the long term, this trend might lead to the spread of forms of organization based on the development of a competitive private market, and a privatization of invention and innovation processes could challenge freedom of access to information itself. The growing confusion between knowledge and information highlights this potential danger. Moreover, is there hope for a large number of developing countries to accede to the knowledge economy, given the huge investments that the most advanced countries have had to make to get there, the current extent of the digital and knowledge divides, and the persistence of development gaps?

Furthermore, UNESCO must avoid the appearance of putting forth its own vision of the building of knowledge societies as another model that would alter the advanced countries' "knowledge economy" and "information society" models. When it comes to development, only "tailor-made" solutions have a chance of succeeding. The successive sets of recommendations made to developing countries on the use of new technologies or the integration of scientific research and its findings into development policies have often been unrealistic. There is still a long way to go towards taking into account the seriousness of the growing asymmetries separating the most advanced countries and the overwhelming majority of the rest

of the world, and whch increasingly widen the knowledge divide even within nations. In some countries with very high growth rates, rural populations, which often make up the majority, may be the first to bear the brunt of a forced march towards the achievement of knowledge societies.

The knowledge economy cannot alone form the basis of a knowledge society project, for it fails to cover all the dimensions of knowledge, which involve a number of values that cannot be reduced to a commodity exchange. Among them, a particular focus has been put on the importance of promoting effective knowledge-sharing, without which some Southern countries might find themselves relegated to the rank of mere consumers of global knowledge. The brain drain, which has intensified in the past few years, especially in the areas of information technology and health care, has stripped those countries of many of their skills and scientific capacities. Genuine knowledge-sharing requires changes that reach well beyond network access to databases in the key sectors of agriculture, health care and information sciences. The international community must truly give itself the means to meet such major challenges as biotechnology applications for agriculture and the fight against infectious diseases such as HIV/AIDS, tuberculosis and malaria – areas in which investments are still modest. That is the price to pay to be able to rightfully speak of knowledge societies for all and for all the countries in the world.

Another stumbling block must be avoided: the nearly widespread tendency to give into technological determinism when imagining the stages of growth of genuine knowledge societies. Innovation is unpredictable by nature, and a mechanical vision of it would fail to take that characteristic into account. A genuine shift towards knowledge societies can only result from the definition of long-term societal goals based on democratic consultation widened to encompass all the social players. However, today those debates remain largely restricted to a limited number of social and institutional players or to the countries that are the most involved, in various ways, in the logic of economies that are based on knowledge, but that remain essentially elitist.

Does the world have the means to promote knowledge societies?

The aims associated with the desire to build knowledge societies are ambitious. Providing basic education for all, promoting lifelong education for all, encouraging the spread of research and development efforts in all countries of the world (with the help of technology transfers, the regulation of the worldwide flow of skills or increased digital solidarity) – all these efforts towards the participation of all in knowledge-sharing and the establishment, even in the most disadvantaged countries, of a true knowledge potential, represent a considerable undertaking. Are such ambitions within reach? Is the international community really giving itself the necessary means and political will?

For the time being, it is not possible to estimate exactly the cost that would be entailed, for the international community, of all the efforts by all countries in the world towards the development of knowledge societies. Suffice it to mention the considerable potential of knowledge that could be made available, in the countries of the South, through greater promotion of local knowledge. The means of ensuring such promotion still remain to be defined, however, and for that reason it is as yet difficult to quantify the cost of such an initiative.

Nevertheless, certain indicators may enable us to form an idea of the efforts remaining to be made if the promise that they hold is some day to be fulfilled. Public spending levels directly influence results obtained in terms of schooling enrolment. While developing countries had 26 million teachers in primary education in 2000, the number of additional teachers required by 2015 is estimated to range from 15 to 35 million (including more than 3 million for sub-Saharan Africa), which represents a considerable increase in budget expenditure.[1] What is more, it is unlikely that economic growth will generate sufficient resources to enable developing countries to attain the goal set by the Millennium Declaration of

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achieving universal primary education by 2015. In Africa, this would require annual economic growth of more than 8 per cent, which seems scarcely possible to envisage for the time being in most of this region's countries. According to UNESCO, achieving universal access to primary education by 2015 in developing countries and countries in transition would cost at least an additional US$5.6 billion a year. Such a figure would require increasing eightfold the amount that those countries currently allocate to education spending.[2]

Even if each country were to rely on its own strengths – this option being hardly practicable for the least developed countries because of the magnitude of the international flow of skills and the particular nature of intellectual property protection systems that favour those who are first on the innovation market – do current trends hold out the hope that knowledge societies will emerge on a global level in a reasonable timeframe? In that perspective, governments are not the only players on the field. The contribution of civil society, as is illustrated in the example of BRAC in Bangladesh,[3] and of the private sector at the country level, also plays a crucial role in that respect. Of course, the growth of knowledge societies also entails clear budget choices as to the priorities decided upon, failing which there would be a risk that the reality of governmental action would not match stated goals. But what solutions are available to developing countries to increase the education budget other than curbing other spending, in particular military expenditure? The experience of Senegal which, in the recent past, reallocated a large share of its budget to education (up to 40 per cent in 2004), is worthy of attention. Military expenditure trends in developing countries and countries in transition, compared with education budget trends, may therefore appear to be an interesting key indicator of the credibility, for some countries, of the stated goal of building knowledge societies and of achieving the MDGs. In the 1990s, military spending declined worldwide to US$780 billion in 1997.[4] From that year on, it soared to US$839 billion in 2001 and US$1,000 billion in 2004.[5] It is also important to note that, besides possible savings on defence budgets, substantial funds could be released to promote education and the rise of knowledge societies by bold reform policies aimed at reducing expenditure, improving the productivity of public services, streamlining government departments, abolishing a number of ineffective subsidies and fighting corruption. The bulk of the resources that would make it possible, on a wider level, to eradicate poverty and to move towards knowledge societies can be found through a reorganization of existing budgets.

In the past few years, a number of political initiatives and innovative methods have been developed and introduced to boost aid to developing countries. Such modalities may also serve to strengthen some of the key components of knowledge societies. Debt swaps are one such tool by which creditors – governments, multilateral development organizations and private sector banks – forgo the repayment of debt stock against firm commitments by recipient countries to invest the funds in specific activities relating to human and sustainable development, often through non-governmental organizations. Among those activities, basic education, environmental management and specific aspects of health policies could be mentioned. While representing investment in social infrastructure, such mechanisms also help to reduce the burden of these countries' foreign debt.

New national planning tools can also contribute to a focus on the key sectors of knowledge societies. They include sector-wide approaches (SWAps), an instrument allowing prioritized and focused assistance and interventions in areas of strategic importance, rounded out by dialogue with all the development partners (government, civil society, the private sector and leading outside donors). SWAps have been used especially in the education sector but can equally serve the health, science and culture sectors. Another increasingly used modality is direct and targeted budget support by donors for specific sectoral activities, in return for an obligation of result.

The regionalization of development initiatives in favour of building knowledge societies is noteworthy because it highlights the importance of focusing

particular attention on the specific features of local situations and on the interdependence, within a given regional area, between the various driving forces behind development. That is the goal of the European Union's 10-year Lisbon strategy adopted in March 2000.[6] In the cases of African countries, the NEPAD, an African Union programme, is also an innovative initiative, based on the desire for an endogenous appropriation of development and the improvement of governance through the implementation of new political and economic approaches promoting peace as well as economic, educational and cultural development. NEPAD also aims at a better integration through regional and subregional partnerships and introduces peer review mechanisms and the support of international solidarity.[7]

ODA itself is key tool for the construction of knowledge societies. But given the decrease in efforts by the donor countries observable today, the outlook is hardly bright. In 2003, ODA dropped to US$69.03 billion, accounting for 0.25 per cent of the GNP of donor countries – falling far short of the goal of 0.7 per cent of the donor countries' GNP recalled in the Monterrey Consensus and at the Johannesburg World Summit on Sustainable Development. What do some tens of billions of dollars represent in 2003, as compared with the some US$200 billion annually spent on tobacco consumption or the US$879 billion of military spending in the world,[8] spending which increased by 11 per cent over 2002? In the field of education, total donations in 2003 stood at US$6.7 billion (of which only US$3 billion was earmarked for higher education).[9] In the 1990s, bilateral assistance to education fell from US$5 billion to US$3.3 billion, thus dropping to only 7 per cent of ODA. In 2003, it was back to US$5 billion, i.e. 7.5 per cent of total bilateral aid. The US$954 million of ODA that multilateral institutions allotted every year, on average, to education between 1996 and 1998, dropped to US$799 million in 1999–2001 and then increased up to US$1.35 billion in 2002–2003.[10] Does this mean that the international community no longer has the means or the political will to promote the development and global growth of knowledge societies?

Three pillars of knowledge societies

In the face of these challenges, the international community, including governments, international governmental and non-governmental organizations and the private sector, should focus on three sets of initiatives that could be viewed as the pillars on which genuine knowledge societies for all can be built:

- a better valuation of existing forms of knowledge to narrow the knowledge divide;
- a more participatory approach to access to knowledge;
- a better integration of knowledge policies.

First pillar: a better enhancement of the value of existing forms of knowledge to narrow the knowledge divide

All societies possess a rich range of knowledge and make use, in their daily lives, of various levels and types of knowledge that they produce and pass on using a wide variety of means, practices and tools. They are a base on which the capacities necessary for their development can sooner or later be built. One of the main stakes in the new phase of globalization that is changing the planet, is to hold on to existing capacities, largely diminished by an outflow of skills, which is on an upward trend.

However, many developing countries, today, are experiencing difficulty in identifying the types of knowledge they possess, in boosting their value and in making their potential work for their development. It is therefore important, first, to raise each society's awareness of the richness of the knowledge it possesses. Those assets should then be better taken advantage of by more precise identification, which in turn would help make the most of the multiple dynamics of globalization. It would also be a good idea to thoroughly identify each society's weak points, in particular with regard to access to information and knowledge. Education and science policies should shift their focus

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accordingly, especially in order to meet urgent needs in the areas of agriculture, water and environmental management, health, industry and services, with the ultimate goal being the strengthening of human security.

Enhancing the value of existing forms of knowledge should involve assessing skills and turning all available assets, no matter how modest, to good account in the areas of education, scientific research and technological development. That might result in a different approach to international negotiations on the liberalization of trade as well as to development and poverty-reduction strategies. As has been observed in the past, disregarding the development potential that knowledge offers can result in serious errors that have, for example, led to the present higher education crisis in Africa and to poverty-fighting strategies dominated by macro-economic orientations, often at the expense of investments in education and health, and without a genuine participatory public debate being able to influence the choice of priorities.

Second pillar: more participatory knowledge societies

Raising awareness of the wealth of available knowledge requires a mobilization of all players in society. It should not be limited to identifying what today is conventionally known as "local or indigenous of knowledge" or "traditional knowledge" in order to increase their value or preserve them. Knowledge societies will not really be worthy of the name unless the greatest possible number of individuals can become knowledge producers rather than mere consumers of already available knowledge.

Nevertheless, there is growing disagreement in international civil society on the very project at the core of knowledge societies, as regards the participation of all. A number of key players associated with the emergence of knowledge societies – teachers, researchers, artists, designers, journalists and non-governmental organization officials – are casting doubt on the justification of political decisions taken on the national, regional and international levels in the areas of research, the environment, health, risk and crisis management, and the growth of new technologies, in particular biotechnologies and nanotechnologies. Consequently, disagreement is surfacing in the circles that care most about the development of knowledge societies. A case in point is the GMO issue. Likewise, in many societies it is becoming increasingly difficult to reach a consensus on the future directions of research and higher education. Settling such disagreements will be crucial for mobilizing all the key players of knowledge societies to meet the challenges of the twenty-first century. Clearly, the debate over future knowledge societies must take place on a more democratic basis in the coming decades in order to more effectively connect the progress of knowledge, the growth of technologies and the need for participation in the perspective of genuine future ethics.

Furthermore, new development and poverty-fighting needs have emerged that illustrate the growing aspirations towards access, inclusion and participation, which continue to be the focus of intense debates on the international level. The modalities of participation, access and inclusion of citizens in emerging knowledge societies needs to be completely rethought. They should not be imagined only from the standpoint of sharing profits that would be defined upstream in a very general way, or as the simple result of new forms of economic growth made possible by an intensive use of new technologies and applications of scientific research. The various players must decide on the models they would like to choose for their development together and in consultation with each other. New institutional forms – hybrid forums, citizens' conferences and debates associating decision-makers, lawmakers, the private sector and civil society – should therefore encourage the growth of future knowledge societies.

Third pillar: a better integration of knowledge policies

The diversity of areas in which the changes that make it possible to diagnose the rise of knowledge societies has been observed can create a certain amount of confusion that will only be dispelled by a better integration of knowledge policies and by a clarification of the end goals underpinning the very idea of the "knowledge society".

In the final analysis, the formulation of long-term policies depends on the definition of those end goals and on the formulation of such a project of society, which will make it possible to confront the challenges of globalization, to meet the needs of knowledge-based development and to achieve the MDGs. The formulation of such policies requires a deepening of research that is still fragmentary (despite the proliferation of local and national projects) on the social impact of various knowledge policies adopted, including educational policies, transformations of access to scientific information, the use of the latter by a wide range of social players and the possible consequences of the progress of e-democracy (e-governance).

Narrowly sector-based policies cannot be relied on if the growth of genuine knowledge societies is to be fostered. Given the goal in question, it is important to vigorously achieve all six goals of the Dakar Framework for Action in the area of basic education. Broader consultation is also required in the area of higher education. At the present time, do we really have adequate tools to accurately measure the magnitude of the challenges facing us?

Is increasing the budgets of education and research systems, including as many people as possible on the local level through the growth of information infrastructures and, on the global level, through an effort of solidarity with the least developed countries, and raising public development aid a dream or a policy? After years of giving intense thought to better understanding the reality of the changes under way, the time has come for the international community to act. The ten recommendations at the end of this report should be read with that in mind. For, if the various knowledge society players, from the public or private sector and civil society, agree on fulfilling that dream and on implementing the necessary policies and conditions, knowledge societies can become the reality of development for all.

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Recommendations

In light of the observations contained in this report and of the possibilities for reflection and action that it explores, UNESCO would like to call the attention of governments on all levels, of governmental and non-governmental organizations, and of the private sector and civil society to the need to implement the following recommendations, which throw into relief the ethical dimension of knowledge societies and propose specific initiatives to spur their growth.

1. Invest more in quality education for all to ensure equal opportunity

Commitment to the expansion of knowledge societies is a matter of global concern. It is indispensable for the reduction of poverty, the implementation of collective security and the effective exercise of human rights. That commitment must translate into not only stepped-up efforts on the part of all the world's countries to reinvest, depending on their means, the fruits of their growth in strengthening the productive capacities of knowledge, but also an increased mobilization of resources in favour of education for all through a better partnership between developing countries, donor countries, civil society and the private sector. In particular:

- Countries should earmark a substantial share of their GDP for education spending and confirm the commitment made at Dakar that "no countries seriously committed to education will be thwarted in their achievement of this goal by a lack of resources".
- Donor countries must significantly raise the percentage of ODA intended for education and, in partnership with the beneficiary countries, make that assistance more reliable, flexible and sustainable. More specifically, they should pledge to provide countries with the additional resources required to achieve the goal of primary education for all.
- The international community should also encourage innovative education and research funding methods, including debt-swaps, and debt and debt service remission, in order to release the resources needed for basic education.
- Governments, the private sector and social partners must explore the possibility of gradually setting up, in the course of the next decades, an education "study time entitlement" that would entitle people to a certain number of years of education after the completion of compulsory schooling, usable by all depending on their personal choices, paths, experience and timetables.
- The contribution of institutions of higher education to lifelong education for all must be encouraged by adopting diversified class schedules and designing relevant formulae.

- All of these steps must benefit in priority the poorest and most marginalized populations, as well as vulnerable groups such as orphans and people with disabilities.
- Access to education and quality education must be thought of as interdependent and inseparable needs and rights. Education must teach learners how to cope with the challenges of the twenty-first century by encouraging, in particular, the development of creativity, the values of good citizenship and democracy, and the skills necessary for everyday and professional life. Education investments must aim to improve the learning environment and the status of all the teaching professions (see Chapters 1, 2, 3, 4, 5 and 10).

2. Increase places of community access to information and communication technologies

To facilitate universal access to networks, it is important to build on the success of certain experiments currently under way in this area. Places of community access, in particular *Community Multimedia Centres*, that promote the spread and sharing of knowledge, and make information and communication technologies new vectors of socialization, should be increased on the national level, especially in developing countries. To strengthen the learning and handling skills of digital tools, the spread and use of freeware and inexpensive computer hardware should be stimulated in communities and countries that lack sufficient resources, and software designers and access providers should be encouraged to produce culturally adapted contents that contribute to the growth of freedom of expression (see Chapters 1 and 2).

3. Widen the contents available for universal access to knowledge

The promotion of the public domain of knowledge is predicated on the notion that it is truly and easily accessible to as many people as possible. The main knowledge centres, such as institutions of higher education, research centres, museums and libraries, should play a greater role in the production and spread of knowledge through better networking made possible by low-cost high-speed connections. The availability and spread of knowledge in the public domain, especially in science, must be integrated into respective policies and laws. The creation of portals of protected works unavailable on the market should be encouraged – subject to the agreement of publishers and copyright-holders – by any entity interested in investing in them: libraries, companies, administrations, and international and non-governmental organizations (see Chapters 3 and 10).

4. Develop collaboratories: towards better scientific knowledge sharing

Collectively managed scientific cooperation networks and infrastructures accessible to researchers from several countries and regions, including those working in developing countries, should be set up. These collaboratories, which enable scientists separated from each other by huge distances to work together on specific projects, such as the study of the human genome or AIDS/HIV research, offer an outstanding way of sharing and spreading knowledge more effectively (interoperability and meta-data standards, facilities, databanks, large information technology centres and possibly larger infrastructures). Setting up collaboratories might lead to the creation of sustainable platforms for sharing knowledge, research and innovation between the planet's different regions, especially along the North-South and South-South axes (see Chapters 6 and 8).

5. Share environmental knowledge for sustainable development

The pursuit of sustainable development goals requires sharing environmental knowledge between industrialized and developing countries. Global environmental monitoring instruments based on local knowledge as well as on scientific and technological knowledge should be developed and the conditions for their implementation should be created. An example is the January 2005 United Nations proposal to create a global warning system for all kinds of natural risks. Such instruments will be indispensable for ensuring the follow-up of major environmental recommendations and could contribute to the creation of a

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genuine public space of Earth information, a source of safety for present and future generations. Environmental knowledge sharing in the framework of new types of partnerships proposed at the Johannesburg World Summit on Sustainable Development should also be encouraged (see Chapter 8).

6. Making linguistic diversity a priority: the challenges of multilingualism

Linguistic diversity is an essential factor of cultural diversity in all its manifestations. Knowledge societies must be based on a "double multilingualism" – that of individuals and that of cyberspace. In addition, it is advisable to encourage bilingualism and, insofar as possible trilingualism, as early as primary school. Furthermore, the creation of multilingual digital contents must be supported, especially in the teaching field. Lastly, the promotion of linguistic diversity in cyberspace must take full advantage of the opportunities offered by the internet as well as other information and communication technologies, for preserving, transforming and raising the value of "minority" languages. Appropriate technologies relied upon for this effort should receive increased research and development investments from the public and private sectors, such as Unicode, automatic translation software, development of international domain names in languages using non-Latin alphabets, etc. (see Chapters 2 and 9).

7. Move towards knowledge certification on the internet: quality labels

It is important to promote thinking about the technical and legal feasibility of knowledge certification norms and standards with the aim of ensuring users' access to a certain number of reliable, relevant contents, especially in the area of scientific information. With regard to the internet, now a major information source, it would be advisable to encourage the setting up of norms and objective guidelines enabling web users to identify sites whose information is particularly reliable and remarkable because of its quality. The definition of norms and standards, necessarily a multidisciplinary task, could unite the efforts of public and private educational, scientific and cultural institutions, as well as the relevant international non-governmental organizations. For example, it could lead to the introduction of quality labels covering a very wide range of knowledge (see Chapters 1, 2 and 8).

8. Intensify the creation of partnerships for digital solidarity

The creation of innovative partnerships bringing together representatives of states, regions, cities, and of relevant international governmental and non-governmental organizations, the private sector and civil society must be stepped up to achieve digital solidarity. This working framework, which emphasizes decentralized initiatives, would be based on mechanisms of solidarity between industrialized countries, newly industrialized countries and developing countries, and within single countries: "digital twinning arrangements" between municipalities and local governments, project "sponsorship" and a more effective use of computers (see Chapters 1, 2 and 6).

9. Increase women's contribution to knowledge societies

Gender equality and women's empowerment must be at the heart of the constituent principles of knowledge societies. The public domain of knowledge must include the contribution of women's specific knowledge. It is important to facilitate women's acquisition of skills and abilities that meet their specific development needs. It will also be important to work towards eliminating gender disparities with targeted measures, such as creating scholarships for girls, setting up special times to allow women in developing countries to become familiar with the internet, increasing the number of female teachers, promoting continuing training opportunities for women and taking steps to encourage their access to scientific research and technological engineering. The creation on a national level of *ombudswomen* (mediators), in charge of hearing cases of confirmed discrimination and monitoring the achievement of these goals over a set period of time, could improve the monitoring of progress achieved in women's participation in positions of responsibility in national and international public organizations and in the private sector (see Chapters 1, 2, 4, 7 and 10).

10. Measure knowledge: towards knowledge society indicators?

The various players concerned could study the feasibility of knowledge society indicators that could contribute to establishing a better definition of priorities with the aim of narrowing the digital divide on the national and international levels. Reliable measuring instruments are indispensable for any policy and action, whether they involve the public sphere, the private sector or civil society. It is therefore advisable to forge, as far as possible, the statistical tools that can be used to measure knowledge by gathering data that involve not only economic variables. Such a monitoring system requires partnerships between governments, international governmental and non-governmental organizations, private businesses and civil society to arrive at a quantitative and qualitative improvement of statistical capacities. In addition to the production of science and technology indicators, in particular in developing countries for which data remain by and large sketchy, this measuring effort should focus on the other constituent dimensions of knowledge societies, such as education, culture and communication (see Chapters 6 and 10).

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Notes

Introduction

1. UNDP *Human Development Report 2001*, *Making New Technologies Work for Human Development*, New York/Oxford, Oxford University Press.

2. As illustrates, for example, the decline of malnutrition in South Asia in the aftermath of the 1960s Green Revolution and the appearance of new vaccines (such as the one against hepatitis B) in the early 1990s.

3. Cf. Manuel Castells, *The Information Age: Economy, Society and Culture,* Vol. 1, *The Rise of the Network Society*. Malden, Mass./Oxford, Blackwell, 1996.

4. Manuel Castells gives the following definition of information: "data that have been organized and communicated". He recalls the simple but relatively open definition given by Daniel Bell: "a set of organized statements of facts or ideas, presenting a reasoned judgement or an experimental result, which is transmitted to others through some communication medium in some systematic form". Information and knowledge are therefore two quite different ideas, yet they share common features, including the organization and communication of data. A knowledge society puts more emphasis on the ability to produce and integrate new knowledge and to access information, knowledge, data and a huge range of know-how. See Manuel Castells, op. cit., p. 38, Note 28.

5. Amartya Sen, *Development as Freedom,* New York, Alfred Knopf, 1999.

6. Since the first United Nations conference in 1963 on making science and technology work for development, there has been scant progress towards significantly integrating the sciences into development in the perspective of sharing knowledge. Hopefully, that integration will be achieved as soon as possible, after the urgent appeals of the 1996 World Conference on Science in Budapest and the publication in 2005 of several reports on the issue by, for example, the World Bank and the Task Force on Science, Technology and Innovation of the United Nations Millennium Project, all of which stress the urgent need to take action – this is the direction in which the development agencies of the main donor countries, such as the United Kingdom, the Netherlands and Canada, seem to have reorientated their actions.

7. See Peter Drucker, *The Age of Discontinuity, Guidelines to our Changing Society,* New York, Harper & Row, 1969.

8. See Robin Mansell and Ulrich Wehn, *Knowledge Societies: Information Technology for Sustainable Development,* New York, United Nations Commission on Science and Technology for Development, Oxford University Press, 1998.

9. See Nico Stehr, *Knowledge Societies: The Transformation of Labour, Property and Knowledge in Contemporary Society,* London, Sage, 1994.

10. Cf. Manuel Castells, *The Information Age: Economy, Society and Culture,* Vol. 1, The Rise of the Network Society, op. cit.; Vol. 2, *The Power of Identity* (1997); Vol. 3, *End of Millenium* (1998). Malden, Mass./ Oxford, Blackwell.

11. UNESCO, Paris, 5–9 October 1998.

12. UNESCO/ICSU, 26 June – 1 July 1999.

13. Johannesburg, 26 August – 4 September 2002.

14. Development agencies focus on the areas of information technology and biotechnologies, by the creation of *poles of excellence*, without always sufficiently taking account of the fact that existing successful poles of excellence, such as Silicon Valley in the United States, Singapore and

Bangalore, India – to mention the most commonly cited examples – have a long history dating back not years but decades.

15. Abilene is an American initiative, launched in 1998, for "advanced networking for leading-edge research and education". See http://abilene.internet2.edu

16. The defense sector's importance in the creation of new forms of knowledge is illustrated by the Advanced Research Projects Agency Network (ARPANET), forerunner of the internet.

17. See UNDP, *World Human Development Report 2003*.

18. See Chapter 10 of this report for more information about the knowledge divide.

19. This is the *knowledge gap* hypothesis. Studies show that the impact on certain types of public of the same knowledge content may vary according to the kind of media used (such as television or print media).

20. As this report is being released, the international community and civil society are planning to hold the second phase of the World Summit on the Information Society, which will take place in Tunis from 16 to 18 November 2005. The purpose of the event will be to assess the progress made in the implementation of the eleven key principles of the Declaration of Principles and corresponding recommended Action Lines in the Plan of Action adopted at the Geneva Summit, and to examine how states can better take into account the positions of civil society, in particular on freedom of expression, the right to privacy, and the right to access to public information and to the public domain of knowledge.

21. For complete references for all background resources sections, please see References.

Chapter 1

1. Communiqué of the Ministerial Round Table "Towards Knowledge Societies", organized during the 32nd session of the General Conference of UNESCO, Paris, 9–10 October 2003 (document 32 C/INF. 26, para. 3), http://unesco.org/images/0013/001321/132114f.pdf.

2. The first phase of the World Summit on the Information Society, organized by the International Telecommunications Union (ITU), took place in Geneva, 10–12 December 2003. The second phase will be held in Tunis, 16–18 November 2005.

3. See the reference document *From the Information Society to Knowledge Societies*, setting out UNESCO's contribution to the preparation of the WSIS, available at the following address: http://portal.unesco.org/ci/fr/ev.php-URL_ID=13775&URL_DO=DO_TOPIC&URL_SECTION=201.html. See also document 166 EX/19 submitted to the 166th session of the Executive Board of UNESCO, available at the following address: http://server_bps.hq.int.unesco.org/Archive/Executive%20Board/English/166/166-EX/166-EX-19/019.doc.

4. See *From the Information Society to Knowledge Societies*, op. cit.

5. Communiqué of the Ministerial Round Table: "Towards Knowledge Societies", op. cit., para. 2.

6. Constitution of the United Nations Educational, Scientific and Cultural Organization, adopted in London on 16 November 1945 and subsequently amended by the General Conference, Preamble, para. 5.

7. See the communiqué of the Ministerial Round Table "Towards Knowledge Societies", op. cit., para. 5.

8. Ibid, para. 11.

9. See Chapter 2 of this report.

10. See Chapter 8 of this report.

11. See http://www.un.org/english/milleniumgoals/index.html.

12. See Cuneo, C., *Globalized and Localized Digital Divides along the Information Highway: A Fragile Synthesis across*

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Bridges, Ramps, Cloverleaves, and Ladders, paper presented at the 33rd Annual Sorokin Lecture (University of Saskatchewan, Canada), 31 January 2002.

13. *Ibid.*

14. One might cite various initiatives such as the diffusion of wireless technologies in Bangladesh towards women of the countryside. Cf. Bhatnagar, Subhash and Dewan, A., *Grameen Telecom: The Village Phone Program: A Case Study for the World Bank,* (http://poverty.worldbank.org/files/14648_Grameen-web.pdf).

15. For more details, see Chapter 10 of this report.

16. See Kaye, S. H., "Disabilities and the Digital Divide", *Disabilities Statistics Centre,* Abstract No. 22, July 2000.

17. For maps shown in Figure 1.1, 1.3 and 1.5, with 2002 data for countries for which 2003 data were not available.

18. This initiative followed on from the establishment, at the July 2000 Kyushu-Okinawa Summit, of a group of experts, the "Digital Opportunity Task Force (Dot.Force)".

19. DSL: Digital subscriber line.

20. According to World Bank data, in 2002 the number of personal computers for 1,000 inhabitants was under 1 in Burkina Faso, 27 in South Africa and 38 in Chile, while it reached 172 in Singapore. See Jensen, Mike, *The African Internet: A Status Report*, July 2002, available at http://www.3.sn.apc.org/africa/afsat.htm.

21. This is actually one of the advantages of the digital network: it costs less than a communication from one point to another. The speed of information transmission, thanks to a modem (20 to 30 pages per minute), is far higher than that of a fax, and far cheaper, for it usually costs the price of a local telephone call.

22. For maps shown in Figures 1.5 and 1.6, some 1999-2001 figures have been used for countries for which 2002 figures were not available.

23. In certain regions that are not yet connected to the internet, although the supply of digital data on a CD-rom sent through the postal mail can look archaic in the age of high-speed internet, it can prove a pragmatic solution half-way between an "old" technology of information diffusion (the post) and a new material for information (digital).

24. On the question of the diversity of contents, also see Chapter 9 of this report.

25. Press crimes committed on the Web tend to become "continuous" infractions. The author of a contested article can be sued as long as it is online, contrary to other media that benefit from a so-called "reduced" prescription (as in France, for instance, where the 1881 Act on the freedom of the press stipulates that press crimes – libel, offence and since 1972 incitement to racial hatred – are forsaken three months after the first publication). Therefore, journalists seem relatively protected from judicial harassment, whereas web users, who are harder to retrieve, seem overpenalized. Let us note however that the mere removal of the accused article from the website could put an end to the tort.

26. This causes technical difficulties. The internet is not a bookshop and does not broadcast programmes at a set time. Therefore it is neither possible to book a restricted space for restricted access in order to keep away certain types of audiences (young children for instance) nor to broadcast some contents at late hours.

27. See Chapter 10 of this report.

28. A detailed table of the different national regimes of exceptions in freedom of information legislation is to be found in Annex II of a publication available on the internet site of the Article 19 of the Centre for Policy Alternatives, Commonwealth Human Rights Initiative, Human Rights Commission of Pakistan, *Global Trends on the Right to Information: A Survey of South Asia*, July 2001 (http://www.article19.org/docimages/1116.htm).

Chapter 2

1. See UNDP, *Human Development Report 2003*.

2. Before the information revolution, if shopkeepers, librarians, contractors or entrepreneurs wanted to be informed of the state of their stocks, they were obliged to take note, as they went along, of every detail of the incoming and outgoing movement of stock, and to keep an up-to-date inventory. With present-day technologies, beginning with bar-code readers, the collecting of this kind of information is carried out automatically with every movement of stock, thus providing information that is more immediate, more complete and more reliable than when it depended on the mental work of individuals.

3. According to the jurist Stefano Rodotà, any privacy protection system should be based on four fundamental principles: the right to oppose, the right not to know, the right to question the finality of knowledge and the right to oblivion. See Rodotà, S., *La démocratie électronique: de nouveaux concepts et expériences politiques*, Rennes, Apogée, 1999.

4. Originally, this right referred particularly to personal information on the health of individuals such as knowing one's state of health or having access to certain genetic information that determines the fate of individuals can indeed be the cause of major traumas.

5. This project called "Autonomic Computing" is the offspring of the philosopher and mathematician Alfred North Whitehead, for whom the progress of civilization can be measured by the number of important operations that one can make without thinking.

6. Those processes are said to be "cognitively distributed": the resources necessary to the accomplishment of a task are shared out between several individuals, even between individuals and artefacts. The theory of distributed cognition takes off from the finding that many cognitive tasks that cannot be resolved by an individual on his own are easily resolved by a network of agents, each possessing limited knowledge. Limitations of memory, time, attention and calculating ability all have considerable effects on our cognitive performances, effects which can be overcome by envisaging cognition as a distributed process.

7. The importance of the promotion of multilingualism will be examined in Chapter 9 of this report.

8. A study by the University of California, Berkeley, puts the amount of digital material at 1.5 billion Go, i.e. an annual average of 250 Mo per person (clearly theoretical, given the digital divide).

9. In 2001, for example, the data sent from Mars by the Viking probes of the National Aeronautics and Space Administration (NASA) in the mid-1970s were lost because the magnetic tape used 25 years previously by the computer was in a format that was no longer readable (*Memory of the Information Society*, UNESCO, 2003).

10. See Chapter 3 of this report.

11. Relevant here are the activities of UNESCO's "Memory of the World" programme – Likewise the work of the IFLA/IPA network: *Preserving the Memory of the World in Perpetuity: A Joint Statement on the Archiving and Preserving of Digital Information* (2002).

12. As observed in Yemen, internet users mainly frequent entertainment sites (45 per cent), followed a long way behind by information sites (23 per cent) and religious sites (19 per cent). A very low percentage of academic research usage was reported (5 per cent). This is attributable, according to the UNDP study, to a number of reasons: Yemeni educational institutions have not integrated the internet into the education system; specialized internet training for academic research is virtually absent in most of the state and private academic institutions and knowledge of English is not very widespread. It should also be noted that online activities such as academic and scientific research, online shopping and e-commerce, and internet governmental transactions are either underutilized or non-existent. In comparison, an enquiry carried out in Peru for the Food and Agriculture Organization of the United Nations (FAO), the ITU and the Inter-American Development Bank (IADB) on users of *cabinas publicas* living in low-income and fairly remote areas shows that the internet user public is mainly made up of students. The type of services provided by these tele-centres seems to indicate that the internet plays a mainly educational role in this context and that the research carried out is either imposed (39 per cent of connections) or independent (12 per cent of research). See Norman, H., *An Overview of the Demographics and Usage Patterns of internet Users in Developing Countries: Yemeni internet Population as a Case Study*, UNDP, 2002 (http://www.undp.org.ye/ict.htm) and Proenza, F. J., Bastidas-Buch, R. and Montero, G., *Telecentres for Socioeconomic and Rural Development in Latin America*, Washington, DC, FAO, ITU, IADB, 2001.

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Chapter 3

1. See, among others, Robert Hutchins, *The Learning Society*, London, Harmondsworth, Penguin, 1968; and Torsten Husén, *The Learning Society*, London, Methuen, 1974. Much work is also being done on this subject in the developing countries.

2. Peter Drucker, *The Age of Discontinuity, Guidelines to our Changing Society,* New York, Harper & Row, 1969.

3. Under this new view of things, Françoise Héritier has put forward an anthropological definition of "innovation" that might be worded as follows: a massive phenomenon making possible the replacement, in a given field, of an old order by a new one that steadily becomes dominant.

4. For a discussion of the ergonomics of knowledge, see Chapter 2 of this report.

5. In Schumpeter's analysis, the entrepreneur acts as an intermediary between the comparatively self-contained worlds of technology and the economy. The degree to which these were self-contained was overestimated by classical economics even in its own time. In the knowledge society it can only be nil.

6. Conceived as a process of creation, transformation and organization of information into knowledge networks.

7. In the context of lifelong learning, the term "teacher" encompasses parents and teachers, of course, but should also ideally comprise all the actors in the individual's life.

8. *Index Translationum* (www.unesco.org/culture/index), the *UNESCO Catalogue of Representative Works* (http://www.unesco.org/culture/lit/rep) and the Library of Congress collections (http://www.loc.gov/) are but a few examples.

9. There are examples in every continent. In France there is the Bibliothèque nationale de France (BNF) (http://www.bnf.fr/), in Quebec the Grande bibliothèque nationale (http://www.bnquebec.ca/), in Egypt the Bibliotheca Alexandrina (http://www.bibalex.org/English/index.aspx), etc. Some people are not happy about this. The philosopher Michel Serres, for instance, considers that the cost of such projects, as compared with the possibilities offered by the internet, makes a project like the BNF a hangover from a bygone world, continuing to function by way of accumulation rather than contributing to dissemination. (Cf. for example the interview given by Serres to the journal *Quart Monde No.* 163, March 1997, "La rédemption du savoir", available at http://agora.qc.ca/textes/serres.html)

10. For further information, one may consult the site of the *Bibliotheca alexandrina*: http://www.bibalex.org/newwebsite.

11. It is estimated that, at the end of 2005, an individual will need an average of 100 Go of personal storage each (this estimate applies of course to the industrialized societies; worldwide, the figure would be lower).

Chapter 4

1. For more details on the Dakar Framework for Action and the achievement of the goals of Education for All, see http://www.unesco.org/education/efa/ed_for_all/dakfram_eng.shtml

2. *EFA Global Monitoring Report 2005. Education for All: The Quality Imperative*, Paris, UNESCO, 2004.

3. There are many parents who, for various reasons, take their children out of school or simply do not enrol them – high enrolment charges or school fees, the extra remuneration often demanded by teachers, the poor performance of education systems and their irrelevance to socio-economic realities, lack of safety and security in schools (affecting girls in particular) and financial difficulties inducing parents to make their children work, either on the informal job market or in the household economy. To all this must be added the problem of civil wars and "failed states". The quality of education systems cannot therefore be separated from the issue of human safety, as we will see in Chapter 8. UIS Figures, Education database, May 2005.

4. See the text of the Salamanca Statement and Framework for Action on the site: http://unesdoc.unesco.org/images/0012/001211/121147f.pdf

5. The most widely accepted definition of information literacy is that of the American Library Association: "To be

information literate, a person must be able to recognize when information is needed and have the ability to locate, evaluate and use effectively the needed information." It is worth noting, however, that there is a growing competition between the terms "information literacy" and "information culture". For more details, cf. http://www.ifla.org/IV/ifla70/prog04.htm.

6. The statistics that follow are taken from UIS (Education database, May 2005).

7. Cf. OECD/CERI, *Schooling for Tomorrow. What Schools for the Future?*, Paris, OECD, 2001, Chap. 3, pp. 77-98. The six scenarios have been analysed by Alain Michel, a CERI expert, in *Futuribles*. (Cf. Michel, A. Six scénarios sur l'Ecole, *Futuribles*, No. 266, July–August 2001, pp. 67-74).

8. On the question of general culture in the knowledge societies, see also Chapter 7 of this report.

9. The contents and arrangements for this third period also vary a great deal according to whether the training system in question is focused on preparing people for the labour market (for example in countries where the apprenticeship system predominates) or whether the systems are more mixed, with a stronger academic component.

10. UIS (Education database, May 2005).

11. More information on APPEAL's activities can be found in its online newsletter: http://www.unescobkk.org/ips/ebooks/subpages/apelbul.html

12. Although some research has sought to prove that the level of public spending has no impact on the results obtained in terms of educational indicators, UNDP has reached the opposite conclusion. See Public policies to improve people"s health and education in UNDP, *Millennium Development Goals: A Compact among Nations to End Human Poverty, Human Development Report 2003*. See also the *EFA Global Monitoring Report 2005. Education for All: The Quality Imperative.*

13. On the new technologies and distance education, see the section in this chapter on "E-learning": new technologies and distance education.

14. Cf. Morin, E., Seven Complex Lessons in Education for the Future, Paris, UNESCO.

15. *Learning: The Treasure Within, Report to UNESCO of the International Commission on Education for the Twenty-first Century*, Paris, UNESCO, 1996.

16. Recommendation of the participants to the Education for All International Forum in Amman, Jordan (16-19 June 1996).

17. See on this question Chapter 10 of this report and the *EFA Global Monitoring Report 2003. Gender and Education for All: The Leap to Equality*, Paris, UNESCO, 2003.

18. In the countries hardest hit by the pandemic, it is estimated that the virus could cause the death of up to 10 per cent of teachers. (Cf http://www.unesco.org/education/efa/ed_for_all/PDF/10sidaed.pdf). On the impact of AIDS on the education sector, see Impact of AIDS on People and Societies, UNAIDS Fourth World Report, *2004-Report on the Global AIDS Epidemic*, http://www.unaids.org/bangkok2004/GAR2004_html_fr/GAR2004_04_fr.htm.

19. This is one of the lessons learned from the *Virtual High School* (Box 4.6), where it can be seen that it requires quite a large number of trained staff.

20. In an interview with *Education Today* (UNESCO) published in January-March 2004, Cristovam Buarque, then Minister of Education of Brazil, stated: "It is the last profession parents think of for their children. The salaries are low and teaching has lost its social status. It has to get this back".

21. See Chapters 6 and 7 of this report.

22. Cf. Chapter 5 of this report.

23. See http://web.mit.edu/is/courseweb/courses.html#5

24. See http://www.ngfl.gov.uk/.

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Chapter 5

1. Thus, in countries with a strong university tradition, such as the United States, France, Belgium or the Netherlands, where approximately 70 per cent of a given age-group are enrolled in higher education, the trend is rather towards modernizing higher education by means of the new technologies and the introduction of quality control aimed at ensuring the relevance of research output. Other countries, such as Mexico, are engaged in a wide range of commercially-oriented experiments in higher education, in which large traditional institutions (such as the Autonomous National University in Mexico City) can play the role of regulator or even counterweight.

2. UIS Education database, May 2005.

3. Projections by Merrill Lynch. See Moe, M. and Blodget, H., *The Knowledge Web: People Power, Fuel for the New Economy,* Merrill Lynch and Co., Global Securities Research and Economic Group, May 2000.

4. Source: UIS Education database May 2005 and García Guadilla, C., The Institutional Basis of Higher Education Research in Latin America with Special Emphasis on the Role Played by International and Regional Organizations, in Schwarz, S. (ed.), *The Institutional Basis of Higher Education Research – Experiences and Perspectives* Dordrecht, Kluwer Academic Publishers, 2000.

5. The reorientations in the World Bank's agenda on higher education in Africa have been quite remarkable: from a policy of "human resources development" in the 1960s, intended to provide African countries with an autonomous development capacity in the space of a few years and recommending strong public support for institutions of higher education, the Bank moved a decade later to a "return on investments" policy, decrying the fact that public expenditure on higher education primarily benefited graduates, subsequently liable to leave the country, rather than the community as a whole. This situation represented poor resource allocation and should be redirected towards basic education and was followed by a policy aimed at reducing the cost per student, increasing admission fees and privatizing institutions. It was only in the 1990s that, faced by the deterioration of higher education systems in Africa, focus was again placed on the importance of public financing, without however reversing the trend towards the increase of admission fees and the privatization of institutions. However, it should be noted that a higher education policy is particularly necessary in Africa since the training of teachers, essential to the promotion of education in this region, is largely dependent on efforts made to develop tertiary education.

6. See García Guadilla, C., *Access to Higher Education: Between Global Market and International and Regional Cooperation*, UNESCO Forum on Higher Education, Research and Knowledge. Colloquium on Research and Higher Education Policy, 1–3 December 2004.

7. Ibid.

8. Ibid.

9. In a recent study by the International Institute of Educational Planning, UNESCO distinguishes other models of virtual universities: newly created institutions on the model of the wholly virtual campus (like Unitar in Malaysia, the Universitat Oberta Catalunya in Spain or the Dakar French-Speaking Campus in Senegal); those that have simply modified their organization to include distance learning (e.g. the Universidad Virtual de Quilmas in Argentina, the Atabasca University in Canada, the African Virtual University-Kenyatta University in Kenya, University of Maryland-University College in the United States, etc.); the model based on a consortium of partners with a view to developing distance education; and, lastly, commercial enterprises specialized in educational services, which often develop in the distance education niche, like NetVarsity in India.

10. See Hazelkorn, E., *Accessing the Knowledge Society: Intended and Unintended Consequences of Higher Education Policy Reviews, 2004*, UNESCO Forum on Higher Education Research and Knowledge Colloquium on Research and Higher Education Policy, 1-3 December 2004 (http://portal.unesco.org/education/fr/ev.php-URL_ID=36312&URL_DO=DO_TOPIC&URL_SECTION=201.html)

11. See also Chapter 4 of this report. Other variants had been proposed previously, such as the notion of "rights to post-secondary education".

12. For more details on changes in the modes of knowledge production, see above and Chapter 6 of this report.

13. The Bologna Process, launched in June 1999 in the city of that name, provides for a further stage in this programme involving the harmonization of higher education systems in Europe by 2010.

14. For more details on this conference, see http://portal.unesco.org/education/fr/ev.php-URL_ID=7148&URL_DO=DO_TOPIC&URL_SECTION=201.html. One of the recommendations of the World Declaration on Higher Education for the Twenty-first Century may be singled out: "Developing entrepreneurial skills and initiative should become major concerns of higher education …" (Art. 7(d).) Furthermore, higher education institutions should "take all necessary measures to reinforce their service to the community, especially their activities aimed at eliminating poverty, intolerance, violence, illiteracy, hunger and disease, through

an interdisciplinary and transdisciplinary approach in the analysis of challenges, problems and different subjects;" (Framework for Priority Action for Change and Development of Higher Education, para. 6(e).)

15. Although research is one of the vital functions of higher education, this topic will be developed at greater length in Chapter 6 of this report.

16. Source: UIS Education database 2005. Those figures only include the doctorates delivered in the universities of the countries. They do not take into account the doctorates nationals receive from foreign universities (for example, the figures on Chile do not include the doctorates of Chilean students attending universities in the United States).

17. Understood as processes of creation, transformation and organization of information in knowledge networks.

18. See Chapter 10 of this report.

Chapter 6

1. The statistical data on OECD countries come from OECD. the data on other countries come from UIS.

2. In 2001, according to the OECD, the EU invested on average 1.9 per cent of its GDP in research and development, against 2.8 per cent for the United States. This figure moreover conceals major differences, since the rate for Sweden was 3.8 per cent, for Finland 3.3 per cent and for France 2.2 per cent, whereas the equivalent rate for Greece was 0.67 per ent and for Portugal 0.7 per cent. See http://www1.oecd.org/publications/e-book/92-2003-04-1-7294/.

3. Reverse engineering analyses how an object functions to create a new different object with identical functions.

4. In certain industrialized countries, military research had long represented up to three-quarters of public research and development expenditure (OECD data).

5. A researcher at the European Organization for Nuclear Research (CERN) in Geneva, he conceived the World Wide Web in 1989.

6. ARPANET was developed, as of 1969, by the US Department of Defense in order to build a computer network invulnerable to attacks on infrastructures. In 1973 ARPANET, became international by connecting up University College (London) and the Royal Radar Establishment (Oslo). There were then 2,000 users of ARPANET. In the 1980s, ARPANET was divided into two different networks, a military one (DDN) and an academic one (NSFnet), and it was the latter which in 1995 became a commercial network.

7. The public/private ratio in the funding of research and development (source of figures – RICYT, UNESCO, OECD, MSTI 2005/1): Latin America and the Caribbean 56.9/37.2; United States 30.2/64.4; OECD 29.9/62.3; Finland 26.1/69.6; Republic of Korea 25.4/72.2.

8. "All things being equal", since it must be stressed that the gaps between the public and private share in the funding of research can also be considerable between industrialized countries – the private sector invests much more in research in the United States or Japan than in the European Union. The European Union has launched a strategy to reduce the gap with the United States, which remains the most innovative country worldwide.

9. See Juma and Yee-Cheang, *Innovation: Applying Development in Knowledge*, 2005.

10. Recommendation 62 of the Science Agenda/Framework for Action says: "Scientific advice is an increasingly necessary factor for informed policy-making in a complex world. Therefore, scientists and scientific bodies should consider it an important responsibility to provide independent advice to the best of their knowledge". See http://www.unesco.ch/biblio-f/wwk_agenda_frame.htm.

11. It is estimated that 25 per cent to 30 per cent of students in India leave their country after obtaining their degree. See Creehan, S., India's IT Crisis, *Harvard International Review*, Vol. 23, No. 2, summer 2001 (http://hir.harvard.edu/articles/index.html?id=895&page=2)

12. See Teferra, D., Revisiting the Brain Mobility Doctrine in the Information Age, Regional Conference on Brain Drain and Capacity Building in Africa, Addis Abeba, 22 to 24. February 2000.

13. See Carrington, W. J. and Detragiache, E., "How extensive is the brain drain?" *Finance & Development: A Quarterly Magazine of the IMF*, Vol. 36, No. 2, 1999 (http://www.imf.org/external/pubs/ft/fandd/1999/06/carringt.htm).

14. Despite a decrease of 7 per cent in the number of visas issued since the events of September 2001. See Jachimovicz,

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M., *Foreign Students and Exchange Visitors, 2003*. (http://www.migrationinformation/org).

15. Abdoulaye Wade, address delivered at the G8 Summit in Sea Island, United States, on 10 June 2004.

16. The causes – necessarily complex – of this aspect of the movement of trained brainpower must be analysed with circumspection, for account must obviously be taken of the internal structures of each job market. The European Commission observes that: "The EU produces a larger number of graduates and PhDs in science and technology than the US (2.14 million in 2000, compared to 2.07 million in the US and 1.1 million in Japan). The EU, however, employs fewer researchers (5.4 researchers per 1000 labour force, against 8.7 in the US and 9.7 in Japan)." (See European Commission, *EU Research Performance: Substantial Progress but Important Challenges Need to be Addressed*, European Commission, Brussels, 2003. Such figures show that account must also be taken of a brain drain away from the scientific career, whether national or international. (http://europa.eu.int/rapid/start/cgi/guesten.ksh?p_action.gettxt=gt&doc=IP/03/389|0|AGED&lg=FR&display=)

17. See Chu, J., How To Plug Europe's Brain Drain, *Time*, Vol. 163, No. 3, 19 January 2004 (http://www.time.com/time/europe/html/040119/brain/story.html).

18. Ibid.

19. See, for example, the site http://www.scienceofcollaboratories.org/.

20. See Glasner, P., From community to "collaboratory"? The human genome mapping project and the changing culture of science, *Science and Public Policy*, 23, 1996. It may be noted that while the collaboratory can assume an institutional form, as in the case of the Human Genome Project, it can also take a much more informal and spontaneous form, as was seen in the 2003 SARS outbreak: "The Severe Acute Respiratory Syndrome (SARS) had barely become public knowledge… before scientists the world over were scrambling to identify the new ill. And it was thanks largely to the information and data exchanged via internet that they were able to isolate the agent causing SARS in record time. The SARS epidemic has highlighted the key role internet can play in a global health emergency; see Erdelen, W., Thank you, Mr Berners-Lee, *A World of Science*, Vol. 1, No. 4, July-September 2003.

21. An interesting solution is to establish, in the neighbourhood of buildings given over to single disciplines, a physical location devoted to the crossing of disciplines. The University of California, Berkeley, has thus undertaken the construction of a building to house the CITRIS (Center for Information Technology Research in the Interest of Society) project (http://www.citris.berkeley.edu/), which is a semi-private interdisciplinary structure. Similar initiatives are to be found in other major North American universities.

22. See NEPAD http://www.touchtech.biz/nepad.

23. See MSF Reports, *A Matter of Public Responsibility*, 2001 (http://www.msf.org/content/page.cfm?articleid= A8293378-5AF5-4AFE-A9CA1D673B1AF764)

24. See http://www.it-environment.org/compenv.html

25. Figures supplied by the United States Environmental Protection Agency (EPA) (http://www.epa.gov/region01/solidwaste/electronic/index.html)

26. See http://www.grid.org/

27. This point is one of the conclusions of the conference "The Role of Science in the Information Society", held in Geneva on 8 and 9 December 2003 by CERN, UNESCO, ICSU, and the Third World Academy of Science, as a prelude to the World Summit on the Information Society. Luciano Maiani, the CERN Director General, sees in grid computing one of the "visible benefits" of science for the information society (http://rsis.web.cern.ch/rsis/Links/speech.html).

28. See http://www.publiclibraryofscience.org/.

29. http://www.soros.org/openaccess/

30. http://archivesic.ccsd.cnrs.fr/

31. WIPO, *Intellectual Property: A Power Tool for Economic Growth*. Geneva, WIPO, 2003.

32. The idea of a market or economy specific to symbolic goods, such as the benefits of religious salvation, was suggested in the early twentieth century by the sociologist Max Weber. The question of economies that are not directly monetary is part of the more general issue of free goods or external effects that are hard to formalize in economic terms.

33. Such a model is studied at the Centre for Intellectual Property Policy at McGill University in Canada. (http://www.law.mcgill.ca/research/centres_cipp-en.htm).

Chapter 7

1. Annan. "Science for All Nations", *Science*, 303, 13 February 2004.

2. For instance, a study of the attitude of European citizens towards science clearly illustrates this point. European Commission surveys in 2001 suggest that, even though Europeans mistrust certain products (such as GMOs), they are far more inclined, at any level of education, to trust scientists than politicians or business leaders; the crisis in science policy is accordingly "political" rather than "scientific". Cf. European Commission, *The Europeans, Science and Technology*, Brussels, 2001 (http://europa.eu.int/comm/public_opinion/archives/ebs/ebs_154_en.pdf).

3. As part of its capacity-building mission, UNESCO has launched a series of manuals intended to help governments, research institutes and businesses to set up specialist ethics committees.

4. Cf. http://user.it.uu.se/pugwash/Etik/uppsalacodex.html.

5. The importance of these issues was emphasized in 1999 at the World Conference on Science in Budapest; the Science Agenda – Framework for Action adopted there gave UNESCO an explicit mandate to prepare a code of science ethics specifying scientists' responsibilities to society. This work is still in progress. See the Science Agenda – Framework for Action, para. 3.2 Ethical Issues, paras. 71–7.

6. Cf. http://www.osha.gov/as/opa/worker/whistle.html.

7. Cf. http://www.unesco.org/science/wcs/background/ethics_uncertainty.htm.

8. Sources: Porchet, M., *Les jeunes et les études scientifiques: les raisons de la "désaffection", un plan d'action.* Report to the French Ministère de l'éducation nationale, de l'enseignement supérieur et de la recherche, Paris, 2002 (http://www.education.gouv.fr/rapport/porchet.pdf); Ourisson, op. cit.

9. See http://www.loreal.com/fr/groupe/index.asp?/loreal-women-in-science:/index.asp and http://www.unesco.org/science/women/evenements_projets/presentation_prix_loreal_unesco.html.

10. To fully understand this difference it may be of interest to compare the sales of the best-sellers in scientific literature destined for the general public with the print runs of the principal science reviews. At the end of 2003 the review *Science* reported some 128,000 subscribers as against 65,000 for *Nature* and 35,000 for *The Lancet* (these figures do not include consultations of articles freely accessible on the internet). Some 82 per cent of subscribers to *Science* lived in North America, as against 10 per cent in Europe, 5.7 per cent in Asia, 1 per cent in Latin America, 0.7 per cent in the Pacific region, 0.4 per cent in the Middle East and 0.2 per cent in Africa. In comparison, over 10 million copies of Stephen Hawking's *A Brief History of Time* have been sold worldwide.

11. National Science Week in South Africa. (Box 7.1) is an event of this type.

12. The term "pseudo-science" designates statements that have the appearance of a scientific presentation but are designed, not to produce empirical knowledge for the use of, and open to criticism by, the scientific community, but to advance a political, ideological or economic agenda. See also the chapter entitled Science and other systems of knowledge in the record of proceedings of the UNESCO World Conference on Science. Cf. UNESCO, World Conference on Science. Science for the Twenty-First Century, A Commitment, World Conference on Science, 26 June-1 July 1999, Budapest, Banson, 2000 (http://unesdoc.unesco.org/images/0012/001207/120706e.pdf).

13. Cf. Gascoigne, T. and Meltcalf, J., Training scientists to understand and love the media in *Science for the Twenty-first Century, A Commitment*, the Report of the 1999 Budapest World Conference on Science, Cetto, A. M., (ed.), London, Banson, 2000.

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Chapter 8

1. See Chapter 6 of this report.

2. See John von Neumann, Can We Survive Technology?, *Fortune,* 1955. This text, whose soul-searching testifies to the conflict between growing geo-political fragmentation and the tendency of technology to affect the world as a whole, constitutes an admission by the inventor (with Oskar Morgenstern) of *games theory* that whatever the progress of the rational mind, no decision in the realm of human affairs can ever dispense with intuition.

3. This paradox, known as Perow's Paradox, is attested in complex systems: when there is tight coupling between accidents, the minutest incident can give rise to major disasters. This is the theory of so-called "normal accidents". See Charles Perrow, *Normal Accidents. Living with High-Risk Technologies*, Princeton, 1999.

4. See Philippe Baumard, *Tacit Knowledge in Organizations*, New York, 1999. This provides the basis for an analysis, for example, of the mechanism of lowered vigilance, that was to lead to the accident involving the Columbia space shuttle on its return to the atmosphere in the spring of 2003.

5. The search for a balance between the moral and scientific dimensions of the precaution has led the European Union to promote a precautionary principle that amounts to proportioning the precaution measures to the scientific plausibility of the risk assumptions.

6. As early as the eighteenth century, Jean-Jacques Rousseau, faced with the earthquake and the tsunami that devastated Lisbon, had had the intuition that we cannot blame nature for building unadapted cities, for "most of our physical pains are our own doing".

7. The case of the eradication of smallpox, one of the great successes of twentieth century medicine, is a good illustration of the point. The disappearance of the illness made it seem pointless to preserve vaccine stocks, and as a result, today the threat of an epidemic provoked by rogue states or individuals is forcing us to recognize how vulnerable we have thereby made ourselves and to rebuild our stocks as a matter of urgency.

8. It is moreover significant that Amartya Sen relates the idea of *human security* to the concept of human development, complemented from the standpoint of growth models by taking into account the risks of negative growth. See the contribution of Amartya Sen, Commission on Human Security, *Security Now, Report of the Commission on Human Security* (Paris, 2003), pp. 1-19. The UNDP defines human development as "a process of enlarging people's choices … the three essential ones are for people to live a long and healthy life, to acquire knowledge and to have access to resources need for a decent standard of living". (*Human Development Report 1990*, Box 1.1, p. 10).

9. The Human Security Network is a group of countries promoting a dialogue over issues related to human security. This network includes Austria, Canada, Chile, Costa Rica, Greece, Ireland, Jordan, Mali, the Netherlands, Norway, Slovenia, Switzerland, Thailand and South Africa (as an observer).

10. See *Human Security Now*, op. cit., p. 17.

11. The case related by Franciso Sagasti is particularly striking: in November 2001, twenty-eight schoolchildren in a remote village in the highlands of Peru died after preparing their powdered milk in a vat reserved for a powerful insecticide. None of them could read the label and they all died from poisoning. See Science, Technology and Globalization, in *The Future of Values*, UNESCO/Berghahn Books, 2004.

12. Cf. Beck, U., Risiko Gesell Schaft, Frankfurt, Suhrkamp.

13. In this respect, it is necessary to accord due value to the broad potential of what is called local, traditional or indigenous knowledge, in order to encourage both risk prevention and the emergence of pluralistic knowledge societies and the respect of cultural diversity (see Chapter 9 and the subsection on Warning Systems and population preparedness earlier in this chapter).

14. For example, the effort made by the first companies that adopted the new norms and set an example in this field should be not only applauded, but also encouraged by tax allowances, prizes and awards (positive sanctions). Conversely, the law must punish the companies that fail to respect the norms (negative sanctions).

15. The promotion of human security is one of the strategic goals of UNESCO. In November 2000, about 100 people met at UNESCO for the First International Meeting of Directors of Peace Research and Training Institutions, in order to establish an Action Plan. Today, UNESCO organizes conferences and leads regional investigations on this theme, in cooperation with regional organizations and institutions (African Union, European Union, ASEAN, FLACSO, etc.). In 2007, UNESCO is planning to hold an interregional conference on human security. See http://www.unesco.org/securipax.

16. See *Human Development Report 1999*: *Globalization with a Human Face.*

17. Indeed, the developing countries must make sure that they do not become experimenting fields for products

under suspicion some richer countries. The assessing procedures of GMOs-related risks raise the issue of their cost. The more complex and precise the tests, the more abundant and varied the data, and the higher the costs of the procedures in equipment, personnel and time. In order to avoid being powerless in the face of such costs, developing countries will probably have to promote regional strategies allowing them to lead the independent tests they consider as necessary and adapted to their environment as well as their agricultural practices.

18. In 2002, The Conference of the Parties to the 1992 Convention on Biological Diversity (CBD) recommended that "in the current absence of reliable data on genetic use restriction technologies, without which there is an inadequate basis on which to assess their potential risks, and in accordance with the precautionary approach, products incorporating such technologies should not be approved by Parties for field testing until appropriate scientific data can justify such testing, and for commercial use until appropriate, authorized and strictly controlled scientific assessments with regard to, *inter alia*, their ecological and socio-economic impacts and any adverse effects for biological diversity, food security and human health have been carried out in a transparent manner and the conditions for their safe and beneficial use validated".

Chapter 9

1. From the time of the World Conference on Cultural Policies (MONDIACULT, Mexico City, 1982), a major change was seen at international forums in the political demarcation of the cultural field. An initially narrow definition of culture, focused essentially on arts and letters, gave way to a broader definition, derived from work in anthropology. This new perspective was taken up in particular by the World Commission on Culture and Development (WCCD), presided over by Javier Pérez de Cuéllar (*Our Creative Diversity. Report of the World Commission on Culture and Development*. Paris, UNESCO, 1995), and the Stockholm Intergovernmental Conference on Cultural Policies for Development (1981), before being inserted at the beginning of the *Universal Declaration on Cultural Diversity* adopted by UNESCO's General Conference at its 31st session, in November 2001: "Culture should be regarded as the set of distinctive spiritual, material, intellectual and emotional features of a society or a social group, and … encompasses, in addition to art and literature, lifestyles, ways of living together, value systems, traditions and beliefs" (preamble).

2. Cf. Constitution of UNESCO.

3. There is no commonly accepted definition of "biopiracy" in the international community. However, SciDevNet suggests the following description: activities linked to the access or use of genetic resources that would conflict with the legal measures in the Convention on Biological Diversity. Biopiracy also refers to illegal patent registrations over genetic resources.

4. "Multilingualism" denotes here a single individual's knowledge of several languages; "plurilingualism" refers to the coexistence of a plurality of languages in a given geographical or political area.

5. *The Future of Values,* op. cit., p. 78.

6. One of the indicators of this predominance is the terminological vagueness surrounding the designation of these "other" types of knowledge, not only in common language, but also, and more generally, in the vocabulary of the human sciences. Within the framework of its programme on Local and Indigenous Knowledge Systems (LINKS), UNESCO has sought to formulate a definition that would help to clarify the aforementioned categories: "Local and indigenous knowledge refers to the cumulative and complex bodies of knowledge, know-how, practices and representations that are maintained and developed by peoples with extended histories of interactions with the natural environment". In 1999, the Budapest World Conference on Science shed further light on the matter by making it clear that what is involved is not only indigenous knowledge but also forms of local knowledge that do not easily fit into the "indigenous" category and whose holders may be for instance farmers

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in Africa, stock breeders in Europe, fishermen in the North Atlantic, etc.

7. New Zealand, for example, whose government has defined the "knowledge society" project as a priority for achieving national integration and whose indigenous Maori population represents nearly 10 per cent of its total population (2004 estimate: 9.7 per cent), has given special attention to the possibilities offered by cyberspace in terms of new forms of cultural expression and creativity. The increase in the number of Maori sites has led logically to a significant upsurge of interest in Maori culture, difficult though it is to measure it (except in terms of the number of visitors to such sites). Cf. R. H. Himona, *Fostering the Creation of Local Contents,* communication at the regional preparatory conference for the World Summit on the Information Society, Tokyo, UNESCO, 2003.

8. The "best practices" database of UNESCO's Management of Social Transformations Programme (MOST) offers an example of an international cross-cutting coordination initiative. It proposes a selection of examples illustrating the use of local knowledge in sustainable and economically viable strategies against poverty. Thus, cases are highlighted where indigenous knowledge has been able to contribute effectively to development, and this may facilitate the possible reproduction of such practices in different cultural and social contexts.

9. Model law on Rights of Local Communities, Farmers, Breeders, and for the regulation of Access to Biological Resources.

10. Decision 391 on the common system of access to genetic resources.

11. Framework agreement on the access to biological and genetic resources.

12. Law on the protection of the environment and the conservation of biodiversity.

13. 2.186-16/01 provisional measure on the access to genetic resources, the protection of traditional knowledge and the sharing of the benefits linked to its use.

14. According to UNESCO, intangible heritage might be defined as "the practices, representations, expressions, as well as the knowledge and skills, that communities, groups and, in some cases, individuals recognize as part of their cultural heritage. It is sometimes called living cultural heritage, and is manifested inter alia in the following domains: oral traditions and expressions, including language as a vehicle of the intangible cultural heritage; performing arts; social practices, rituals and festive events; knowledge and practices concerning nature and the universe; traditional craftsmanship. The intangible cultural heritage is transmitted from generation to generation, and is constantly recreated by communities and groups, in response to their environment, their interaction with nature, and their historical conditions of existence. It provides people with a sense of identity and continuity, and its safeguarding promotes, sustains, and develops cultural diversity and creativity" (http://portal.unesco.org/culture/en/ev.php-URL_ID=2225&URL_DO=DO_TOPIC&URL_SECTION=201.html).

15. In particular, Terralingua, Lingualsphere Observatory, the Summer Institute for Linguistics International, the International Federation of Teachers of Living Languages, and Language Rights.

16. Linguapax has now become a non-governmental organization that endorses this name and this mission originally created on the initiative of UNESCO. See http://www.linguapax.org/en/eduang.html.

17. Among the main international legal instruments dealing with linguistic rights, mention may be made of the International Covenant on Civil and Political Rights (adopted by the United Nations in 1966, and which came into force in 1976); the Convention against Discrimination in Education, adopted by UNESCO in 1960; and the Declaration on the Rights of Persons belonging to National or Ethnic, Religious or Linguistic Minorities, adopted by the United Nations in 1992. In addition, a Universal Declaration of Linguistic Rights was adopted in Barcelona in 1996 by numerous institutions and non-governmental organizations. Article 27 of the International Covenant on Civil and Political Rights stipulates that "In those States in which ethnic, religious or linguistic minorities exist, persons belonging to such minorities shall not be denied the right, in community with the other members of their group, to enjoy their own culture, to profess and practise their own religion, or to use their own language". The Convention against Discrimination in Education makes specific mention of linguistic rights in education.

18. This was recalled at the Tenth Congress of Linguapax (Barcelona, 2004).

19. In 2001, it was estimated that 70 per cent of scientific publications in circulation were written in English. The proportion of those in French was 17 per cent, in second position, while for publications in German it was hardly more than 3 per cent and in Spanish 1.37 per cent. See Hamel, R. E., El español como lengua de las ciencias frente a la globalización del inglés, Congreso internacional sobre lenguas neolatinas en la comunicación especializada (El Colegio de México, Mexico City, 28–29 November 2002).

20. Compare the positions of John Paolilo with those of Daniel Pimienta, which are to be presented in a study

UNESCO is preparing for the second phase of the World Summit on the Information Society to be held in Tunis in November 2005.

21. Unicode, which was created in 1991 out of an initiative gathering several companies in the information technologies sector, relies on a simple principle: the encoding of each given character under one specific figure. Today, Unicode is able to treat 65,000 specific characters – which means potentially all the writing systems of the world. It is progressively replacing the American Standard Code for Information Interchange (ASCII) and now makes it possible to encode correctly in the same text languages whose writing systems are very different, such as Chinese, Arabic, Sängö, Fulfude, Spanish and French.

22. Cf. *Declaration of Principles on Tolerance*, adopted and signed by the UNESCO General Conference at its 28th session on 16 November 1995.

23. Cf. Paul Ricœur, Universal Project, Multiple Heritages, in *The Future of Values,* op. cit.

Chapter 10

1. We are talking here about knowledge as an assimilable or exchangeable commodity, (i.e. knowledge in the form of information: hence knowledge and information here, and in this case alone, are interchangeable).

2. Cf. Chapter 9 of this report.

3. Cf. Chapter 6 of this report.

4. In the countries of the South, certain proactive *knowledge-based development* policies have led to altogether remarkable performances as compared with those of other economies. Why is per capita GDP (with parity of purchasing power) in the Republic of Korea, in 2003, 8 times higher than that of Ghana in 2002, and 26 times higher than that of the Democratic Republic of Congo, according to UNDP data (*World Human Development Report* 2004), while per capita GDP in those countries was practically identical 45 years ago?

5. See *Third Outline Perspective Plan 2001-2010*, Malaysia, 2001, Chapter 5 (http://unpan1.un.org/intradoc/groups/public/documents/APCITY/UNPAN003661.pdf)

6. See *Understanding Knowledge Societies in Twenty Questions and Answers with the Index of Knowledge Societies,* report of the Department of Economic and Social Affairs of the United Nations Secretariat, May 2005. Cf. http://www.unpan.org/cdrom-dpadm/DPADM/Understanding%20Knowledge%20Societies%20(2005).pdf

7. Francisco Sagasti, "The Knowledge Explosion and the Knowledge Divide", UNDP Background Paper, Cf. http://www.hdr.undp.org/docs/publications/ background_papers/sagasti.doc.

8. See *Third Outline Perspective Plan 2001-2010,* op. cit.

9. It should be noted that the last three diagrams in Box 10.3 seem to give excessive importance to the technological components of knowledge over the other components (scientific research, school enrolment, etc.), even though illiteracy is included in the perimeter of the dimensions studied. Hence it is likely that they are a better index of the digital divide than of the knowledge divide.

10. Even more, as we have seen before, a difference of knowledge – such as that existing between the respective fields of specialization of a physicist and a sociologist, may even prove fruitful when it is turned to account in multidisciplinary strategies to create new knowledge (without however changing the difference of knowledge that existed between them).

11. Many had enthusiastically announced the rise of a new order for social relations, in which individuals would express themselves on a computer under a virtual identity and would be deprived of any vocal inflexion or body language or other usual signs of a conversation and could not therefore be distinguished according to the gender.

12. UIS, Database on literacy, June 2005.

13. Thus, in Canada and the United States, the internet is used slightly more by women than by men. From this point of view, the split is not a split between Europe and North America on the one hand, and the rest of the world on the other, since the proportion of women internet users as opposed to men is higher in the Republic of Korea, Brazil or Singapore than in the United Kingdom, France, Germany or Italy. Cf. Minges, M. and Kelly, T., *Asia-Pacific Telecommunication Indicators 2002*, Geneva, ITU, 2002.

14. Resolution 41 adopted by the General Conference of UNESCO at its 30th session, 17 November 1999.

15. Cf. http://portal.unesco.org/ci/en/file_download.php/cec02683d1c6ff7747a8049285a8bbbfRecommendation-Fre.pdf.

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16. UNESCO, *Medium-Term Strategy 2002-2007,* para. 27 (document 31C/4 approved by the General Conference of UNESCO at its 31st session, October 2001) "In light of the ongoing and new global challenges, UNESCO's mission during the medium-term period 2002-2007 will be to contribute to peace and human development in an era of globalization through education, the sciences, culture and communication, based on three main strategic thrusts. These three distinct, yet interrelated axes are: a) developing universal principles and norms, based on shared values, in order to meet emerging challenges in education, science, culture and communication and to protect and strengthen the "common public good" (…)". Another expression, linked to that of "common public good" deserves to be noted (para. 29) that of the world's intellectual commons: "At the beginning of the twenty-first century, UNESCO's mission can then be characterized in terms of the following action items: providing a platform for dialogue and action – involving both the public and the private sectors – concerning the world's intellectual commons (…)". Cf. (http://unesdoc.unesco.org/images/0012/001254/125434e.pdf).

17. Since the work of the economists Coase and Williamson, we know that, under certain hypotheses, the market may equalize the firm's conditions of production. The lowering of transaction costs in network societies thus makes it possible for a new type of productive organization to emerge involving exchange and collaboration within a single sharing community This law is known by the name of *Coase's theorem.*

18. The discussion here on open access to scientific information and data stems from an International Symposium on Open Access and the Public Domain in Digital Data and Information for Science, 10–11 March 2003, jointly organized by UNESCO, ICSU, the Committee on Data for Science and Technology (CODATA), the US National Academies and the International Council for Scientific and Technical Information (ICSTI), and the Workshop on Science in the Information Society that followed the next day.

19. *Creative Commons* proposes model copyright licences (for music creation and academic publications alike) that, instead of submitting for the prior authorization of copyright holders any act that does not qualify for a legal waiver, "allow certain uses to be authorized for the public in advance under conditions stipulated by the author". Cf. (http://creativecommons.org/).

20. This balance highlights the tension that exists between the two paragraphs of Article 27 of the Universal Declaration of Human Rights. Cf. Chapter 3 in this report.

21. The concept of appropriation covers more than one reality. One should not overlook the distinction that exists between private appropriation and public appropriation. The concept of appropriation is often equated with forms of acquisition by individuals, private enterprises or institutions – just as the public domain is often identified with what pertains to the state or local authorities. The concept of public appropriation touches however on an important field, that of goods or knowledge belonging to public authorities or to the state, but that are not accessible to the public. The secrecy surrounding R&D in the field of national defense, intelligence or certain confidential administrative procedures reflects such appropriation. Similarly, the patents that some universities or laboratories may take out are a form of public appropriation.

22. UNESCO associated itself with this movement by publishing in May 2004 a document entitled *Policy Guidelines for the Development and Promotion of Governmental Public Domain Information*, which is accessible at http://portal.unesco.org/ci/en/ev.php-URL_ID=15862&URL_DO=DO_TOPIC&URL_SECTION=201.html

23. In the ancient world, citizenship referred among other things to the capacity to have free time to attend to public affairs. But it entailed numerous exclusions based on status: slaves, women, metics (resident non-citizens of a city of Greek origin), "barbarians" (residents of non-Greek origin), etc. Capacity then depended on the economic autonomy of voters, which was supposed to preserve them from corruption and make truly free men out of them: this was the theory of suffrage based on poll tax aimed at justifying the fact that political rights were reserved essentially for landowners. It was only with the idea of universal suffrage that it became possible to conceive of a universal political capacity linked to knowledge.

24. For more explanations, especially on different forms of political activism according to Pippa Norris, see http://www.pippanorris.com.

25. Cf. Chapter 8 of this report.

26. As illustrated by the proliferation of non-governmental organizations or the success of the major forums organized by civil society.

Conclusion

1. See UNDP, *Human Development Report 2003, Millennium Development Goals: A Compact Among Nations to End Human Poverty*, New York/Oxford, Oxford University Press, 2003.

2. See the *EFA Global Monitoring Report 2002, Education for All: Is the World on Track?* Paris, UNESCO, 2002.

3. BRAC (formerly the Bangladesh Rural Advancement Committee), set up in 1972, is the longest standing non-governmental organization in Bangladesh. It employs 27,000 people nationwide and its activities span three main areas: economic development, health and education. With the poor as its target population, BRAC, which defines itself as a "private development organization", advocates an integrated approach to development. The non-governmental organization works in partnership with the government on certain major national programmes. See http://www.brac.net

4. Figures presented by the foundation headed by Oscar Arias, former president of Costa Rica and 1987 Nobel Peace Prize Winner.

5. According to estimates by the Stockholm International Peace Research Institute (SIPRI), the amount is more than US$1,000 billion. See http://yearbook2005.sipri.org/highl/highlights

6. http://europa.eu.int/growthandjobs

7. See http://www.nepad.org.

8. See SIPRI, op. cit.

9. Bilateral and multilateral assistance.

10. Source: OECD, International Development Statistics, August 2005. See http://www.oecd.org/dae/stats/idsonlinc

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The scientific upheavals over the course of the twentieth century gave rise to a third industrial revolution: that of new technologies, accompanied by the further advance of globalization. The resulting knowledge economy has placed cognitive resources at the centre of human activity and social dynamics. Does this mean that the twenty-first century will see the emergence of shared knowledge societies? Moreover, the digital divide is itself the consequence of a more serious split. The knowledge divide, today more than ever, separates countries endowed with powerful research and development potential, highly effective education systems, and a range of public learning and cultural facilities, from nations with deficient education systems and research institutions starved of resources, and suffering as a result of the brain drain. Another gap is opening up between the most advanced knowledge societies and those rich countries failing to invest adequately in research and knowledge. This leads to a brain drain along North-North lines. Building shared knowledge societies will be the key to a new and 'intelligent' form of sustainable human development in the new world currently taking shape before our eyes.

The UNESCO World Report offers a future-oriented overview of the upheavals through which we are living. Are the new technologies the miracle cure for inequalities and exclusion? How, in a democratic setting, should public debate be organized on the ethical questions prompted by new knowledge and technologies, such as genetic engineering, biotechnologies and nanotechnology? Shall we see the emergence of a planetary awareness of the risks human activity is posing to the planet and the species? Are we witnessing the rise of 'learning societies'? Is the construction of genuine knowledge societies dependent on addressing that major challenge of the twenty-first century – lifelong education for all? And what will higher education systems look like in the future? Knowledge also needs to be shared. The 'collaboratory' institution, favouring an approach to scientific research based on sharing (particularly between North and South), the networking of knowledge centres, and the pooling of relevant information are promising pointers. They all suggest that the path to shared knowledge societies may lie in the direction of cooperation, and not only that of competition and emulation.

Several issues form the subject of current global debate and call for hard choices on the norms that are to prevail in the societies of tomorrow. These issues include the safeguarding of cultural and linguistic diversity, the scope – or indeed extension – of the knowledge 'commons', digital solidarity between North and South, questions of copyright and intellectual property, and the relationship between knowledge and wisdom (which takes us into the realm of ethics). This first UNESCO World Report sets out to explore an uncertain future while proposing lines of enquiry and action. Its fundamental aim is the pooling, rather than the partition, of knowledge.

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