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Paper No. 9
Information and Communication Technologies (ICT) and Development: Highway or Dirt Track?

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Draft Copy
1. Preface
With contemporary technological innovations rapidly advancing, there is a common prevailing expectation that the progress in this field will have a profound impact on societies. On the other side, expert opinions differ about whether this impact will be positive or negative. In fact it is difficult, if not impossible, to foresee the future social and economic implications of the adoption and proliferation of new information and communication technologies, and this creates a serious problem for policy makers. Against this background, it is important to investigate the ambiguities inherent in the current process of technological change and to give concerted attention to specification of the social and institutional changes that will be required to strengthen its potential for social development.

During the 1950s, many developing countries began to take an interest in strengthening their information and communications capabilities, particularly in the fields of printing and broadcasting, telephone and telex. It was assumed that the technologies which had lifted the advanced industrial countries to unprecedented heights of material wealth could be used to accomplish the same results in the developing world.

By and large, policy makers in the developing countries were concerned with the availability of technological products, rather than with the more complex problems associated with their political, economic and cultural integration. Thus little or no attention was given to meeting the infrastructural requirements for a productive assimilation of imported science and technology in the recipient countries. The process of technology choice also tended to be undemocratic. Very seldom was there a comprehensive analysis of needs and alternative choices to meet those needs, nor was there usually any public consultation on alternatives. The state of most policy-making was characterized by an emphasis more on operational choices (procurement and deployment) than on strategic choice (the direction of technological development).

When, in the course of the 1960s, the volume of transferred technology increased considerably, many recipient countries became aware of the fact that the transfer usually consisted of end-products rather than of technology per se, that much of the transfer took place as intra-firm movements, that the conditions under which transfer took place were often disadvantageous for them, and that much of the technology was inappropriate, obsolete, over-priced, or all of these together.

By the 1970s, the introduction of ICTs such as telephony, educational television and satellite communications began to show a specific pattern of social benefits in most developing countries. Various studies suggested that the primary beneficiaries were the companies that provided the equipment (for example telephone companies), the banking consortia providing the funding, and the local administrative elites who used the new technology. Often unforeseen negative secondary effects occurred, such as serious balance of payments problems associated with the capital intensity of the new technologies.
All this gave rise to spirited debate within UNESCO and the United Nations General Assembly, and eventually to a proposal for a New Information and Communications Order. When the dust of this debate subsided, many developing countries — adverse experiences notwithstanding — expressed a strong interest in receiving foreign aid to develop their information and communication infrastructures. Aid programs were established in the fields of mass media and telecommunications development, recommending more investment in telecommunications in developing countries and more resources for training and transfer of technology. The common opinion was that ICTs are not only critical to economic development, but also that they unleash forces transforming education, enriching national cultures and reinforcing social cohesion.

In the 1980s, Third World leaders came to share the expectation within industrial nations that innovations in telecommunications and computer technologies could markedly improve industrial performance and increase economic productivity. Furthermore, there was a common belief that ICTs in fact enable developing economies to leapfrog over industrialization into a post-industrial society. With this hope, developing countries began to launch policies and programs to acquire a share in international satellite communications and transborder data flow networks.

In many developing countries, however, there was also anxiety concerning the possibility that ICTs might imply serious social risks. People were concerned about issues like the potential for cultural colonialism, the erosion of individual privacy and national sovereignty. Towards the end of the 1980s these fears seemed to have abated, and the general view on the relation between ICTs and development entered a third and current phase. This phase is driven by a very strong fear of being left behind and cut off from the emerging global digital highway. The general belief seems to be that, without adequate access to the system, developing countries cannot hope to be economically competitive. Therefore, in many developing countries the "digital rush" is on to create and broaden links with electronic networks in the fields of trade, finance, transport and science. Such a position is inspired by recognition of the obvious benefits that digital information and communication technologies have to offer (at least in principle) in a number of concrete areas, such as education (distance learning, online library access) or health services.

The growing ICT demand in developing countries finds expression in long waiting lists for telephone connections, growing use of cellular systems and rapidly expanding numbers of Internet users. To meet this demand, consideration of information and communications technologies is increasingly becoming an integral part of national development agendas. Examples in Asia are India, China, Malaysia and Korea.

Nevertheless, there were serious concerns about the existing disparity between the information-rich and the information-poor countries. Therefore, the G-7 governments committed themselves to "promoting universal service to ensure opportunities for all to participate" and "encouraging dialogue on worldwide co-operation", so that industrialized countries would work toward the participation of developing countries in the Global Information Infrastructure. The main initiator of the GII project, US Vice-President Al Gore, stated in his speech at the conference of the International Telecommunications Union in Buenos Aires (March 1994) that the creation of a Global Information Infrastructure is in fact "an essential prerequisite to sustainable development for all members of the human family".
3. Digital Disparities

Concern about information disparities between rich and poor countries is well founded. There seems to be general agreement in the scientific literature and in public policy statements that the ICT-gap between the developed and developing nations is widening and that this hinders the integration of all countries into the Global Information Society.

The seriousness of the ICT-gap is clearly demonstrated by figures on the world distribution of telephony. There are 1 billion telephones in the world today and approximately 5.7 billion people. Some 15 per cent of the latter have access to 71 per cent of the world's main telephone lines. At the same time, more than 50 per cent of the world's people have never even used a telephone. Put differently, low income countries (where 55 per cent of the population of the planet is to be found) have less than 5 per cent of the world share of telephone lines. And while high income countries have 50 telephone lines per 100 inhabitants, many low income countries have less than one telephone line per 100. This ranges from Cambodia with 0.06 to China with 0.98 in 1992 (according to figures provided by the ITU/BDT Telecommunication Indicator Database).

The reality of the widening gap in telecommunications capacity raises serious questions about whether the poorer countries will be able to overcome the financial and technical obstacles that hamper their access to digital technologies. Since reducing the ICT gap requires a major financial effort, one central concern is whether the international community is ready to provide the massive investments needed for the renovation, upgrading and expansion of networks in developing countries. To understand the magnitude of the challenge, it is useful to remember that it would take some US$ 12 billion to assure 50 per cent of the population of the Philippines access to the Internet.

These international initiatives coincide with continuing concern about the appropriateness of the technologies being transferred and the capacity of recipient countries to gain control over them. In fact, there is at present no convincing evidence that the owners of advanced technologies will change their attitudes and policies towards the international transfer of technology. Throughout the past decades, the prevailing international policies in this field have erected formidable obstacles to the reduction of North-South technology gaps. There is no indication that the current restrictive business practices, constraints on the ownership of knowledge, and rules on intellectual property rights that are adverse to developing country interests are radically changing. And in this case, there are no realistic prospects that the relations between ICT-rich and ICT-poor countries will change in the near future.

Furthermore, the key actors in international ICT policy-making have expressed a clear preference for leaving the construction of the Global Information Infrastructure to "the forces of the free market", and there is room for doubt about whether the institutional arrangements of a corporate-capitalist market economy allow for the development of an equitable information society.

At any rate, it is important to think carefully about whether, given the realities of the existing international economic order, there can be any serious reduction in existing ICT disparities. It may well be an illusion to think that ICT-poor countries can "catch up" or keep pace with advances in the most technologically advanced societies. In the North the rate of
technological development is very high and is supported by enormous resources. This is certain not to say that poor countries should not try to upgrade their ICT systems. But they should not do so in the unrealistic expectation that those who are ahead will wait for them. The situation may improve for poorer countries, but the disparity between North and South is not likely to go away.

Unfortunately, in most countries concern about access to digital technologies is met by public policies that tend largely to react to an already defined technological environment — in part because the capacity to identify appropriate digital technologies is not locally available. This postpones necessary efforts to consider the kinds of digital technologies that might be appropriate for their specific development trajectory. The problem is compounded by the fact that, in many cases, Third World states seem to have no disinterested non-governmental organizations to advise them on telecommunication technology and on the social objectives of regulation, in order to safeguard those interests that private profit will not protect. Without adequate regulatory intervention to ensure accountability to the general public, market forces responding to [the needs of] groups with purchasing power are bound to generate unequal development. And to make matters worse, there is also a critical absence of co-ordination of “digital” policies among the developing countries themselves.

It is essential for all societies around the world to understand that planning for the adoption and deployment of digital technologies can no longer be a local affair. Global negotiations such as the recent Uruguay Round on multilateral trade, and international institutions like the World Trade Organization, have enormous impact on national technology plans. Therefore, developing countries must participate more forcefully and effectively in these institutions, basing their actions on greater policy co-ordination. But the G-77 lacks a research facility or a permanent secretariat, and is unable to carry out long-term planning or strategizing for international meetings and negotiations. Without policy co-ordination, many developing countries do not obtain a fair share of the benefits of globalization, and some actually suffer net losses.

4. Cultural Globalization

Even if the developing countries are integrated into the global digital grid, there is concern in many quarters that the growth of transnational cultural industries, as well as liberalization policies pursued by such bodies as the World Trade Organization, may reinforce current patterns of cultural colonialism. In fact, technological innovations, the enormous growth of international trade and a very supportive liberal political climate have facilitated the rapid transnational proliferation of mass-market advertising and electronic entertainment produced by a handful of mega-conglomerates. A uniform consumer lifestyle is being aggressively marketed across the globe.

Pop culture is America’s hottest export item today. US movies, music, TV programming and home video now create an US$ 8 billion trade surplus in this sector. Top sellers are Mickey Mouse, Madonna, Michael Jackson, McDonald’s burgers, Levi’s jeans and Coca Cola. In the past five years the overseas revenues of Hollywood studios have doubled. The US$ 20 billion music industry earns approximately 70 per cent of its revenues outside the United States. Clearly, there is a worldwide trend towards increasing demand for American entertainment.
The global proliferation of standardized food, clothing, music and television drama, as well as Anglo Saxon business style and linguistic convention, contribute to an unprecedented cultural homogenization. (The Disney amusement parks, whether on the East or West coast of the United States, Tokyo or Paris, are a lively expression of this cultural globalization.) In addition, such cultural conquest has important implications for patterns of economic development and may create serious obstacles to self-reliant strategies. Furthermore it promotes a consumerist, resource-intensive lifestyle that the world's natural environment can ill afford.

Aggressive around-the-clock marketing, controlled information flows that do not confront people with the long-term effects of an ecologically detrimental lifestyle, aggressive exercise of competitive advantage against local cultural providers — all encourage a reduction of local cultural space.

But even if "global culture" is not an adequate category of analysis, a process of "cultural globalization" is undoubtedly under way. As information and communications technologies open new markets, Dutch, German or Japanese firms join American transnationals in selling consumerism across the globe. Maintaining American style and production values, media products have now become the generic material for all transnationals, whatever their ownership base. Fusing different sources of capital, the global transnational information and cultural producers are turning the world into a shopping mall for those with sufficient disposable income.

In the process, global operators have understood that adaptations of generic products to local tastes can improve their likelihood of success. The performance of MTV, the music television station, in Asian markets is a good case in point. MTV beams its signals to Asian audiences through one of the channels on Satellite Television Asian Region (STAR TV). This Hong Kong-based satellite operator reaches some 3.75 million households in Asian countries. With many Asian youngsters ready to spend on global pop culture, this is clearly a promising market for MTV advertisers. In order to accommodate local tastes, some 20 per cent of MTV programming is Asian. This includes the promotion of Thai and Chinese pop stars, as well as Mando-Rock music sung in Mandarin.

Although MTV products may be regionally customized, the effort is primarily oriented toward offering advertisers a profitable market for consumer products and luring consumers — particularly young ones — into watching its programs. The process plays a role in changing their tastes, lifestyles and moral values.

Opinions differ regarding the effect of cultural globalization. In the Asian region, for example, one finds optimistic positions like the following: "We in Asia have a particular advantage . . . nobody has yet moulded us. . . . Even in the most economically advanced Asian societies, we are a very tradition-minded people" (Joseph Wang, advertising expert from Hong Kong). But one can also find less optimistic positions: "Thai society today is indeed in a state of confusion and expedient Westernization. McDonald's, Burger King, Dunkin Donuts. Fast foods and fast profits. . . . Thai culture and traditions are becoming obsolete and irrelevant, if not outright obstacles to modernization and Westernization" (Yos Santasombat, an anthropologist from Thailand).
5. Digital Technologies: Choices for Social Development

Given the growing demand for digital technologies, policy makers will have to take decisions that adjust technological potential to the requirements of social development. Yet the "digital landscape" is kaleidoscopic. On the one hand, there are strong expectations that digital technologies will create a bright future. On the other hand, there are very pessimistic projections that point to serious social and economic problems. And empirical reality completely supports neither the utopians nor the dystopians. The question in this confusing situation is thus how one can arrive at defensible policy choices.

The techno-centric perspective

In much utopian writing, ICTs represent a revolutionary force that can fundamentally transform societies and individual lives. In this perspective, the imperatives of technological development determine social arrangements: technological potential drives history. Furthermore, the techno-centric perspective holds that the "digital revolution" definitively marks the passage of world history into a post-industrial stage. The emerging global information society is characterized by positive features: there will be more effective healthcare, better education, more information and diversity of culture. New digital technologies create more choice for people in education, shopping, entertainment, news media and travel. From this perspective, there is no reason to put technology itself on the public agenda, since the technological process is accepted as inevitable. For the protagonists of the "digital revolution" it is not conceivable that people would decide not to adopt these innovations.

The gravest problem with the techno-centric perspective is that it ignores the social origins of information and communication technologies. It suggests that they originate in a socio-economic vacuum, and fails to see the specific interests that generate them. Guided by this perspective, policy makers find it very difficult to accept that technological innovations do not, in and of themselves, create the institutional arrangements within which they function; and thus they fail to see that whether the potential of technologies will be realized in positive rather than negative ways depends much more on their institutional organization than on the features of their technical performance.

If the technological environment is accepted as given, then options of decision makers are limited to reactive policies and programmes, designed to cope with, or adapt to, the consequences of technical change, rather than anticipating (and so influencing) these consequences. Unless we understand what problems the major stakeholders want to see resolved and what technical systems they select, policy makers cannot anticipate the consequences of these systems and thus make a concerted attempt to influence their design in socially beneficial ways.

The perspective of discontinuity

The techno-centric perspective is characterized by a strong emphasis upon the discontinuity of historical processes. Its analytical approach is based upon the notion that a technological discontinuity (the "digital revolution") causes a social discontinuity. In its fascination with "revolutions", the perspective overlooks the fact that technological processes are only rarely revolutionary and most often proceed in gradual ways over longer periods of time. Technological developments can hardly ever be described as radical breakthroughs. Studies on technological inventions usually demonstrate that innovations have (often long) prehistories of conceptual and technical development. Thus today's ICTs evolve quite logically from earlier technological generations. Size diminishes, speed increases and capacity
expands — but this is hardly revolutionary. Almost all developments today are just further refinements of what was there already.

This observation does not imply that there are no significant technological breakthroughs in the application of digital technologies or that these could not create new concepts and methods of information handling which might interact with social processes in ways radically different from past experiences. The point is that it is often too early and too facile to label current processes as revolutions, since it may take quite some time before new concepts and methods translate into new patterns of social behaviour, new lifestyles, political and economic structures, and viable virtual communities.

A serious problem with the concept of technological revolution is that, when such a term is used, it becomes harder for policy makers to see that technological innovations come in different layers of "newness". Developments such as the Internet are not monolithic. They have various dimensions, ranging from techniques that are only slightly different from previous ICTs (such as e-mail in comparison to "snail" mail) to techniques that show less and less resemblance to earlier modes of information handling (such as newsgroups, Internet Relay Chats, and three-dimensional graphical presentations in virtual reality).

Meanwhile, overemphasis on historical discontinuity makes it difficult, if not impossible, to deal in any realistic way with the empirical finding that in most societies actually-existing processes of social change lag far behind visionary predictions. Thus the discontinuity perspective is not very helpful in dealing with what has been called the "computer paradox". Computers are applied by some 50 per cent of the work force in the industrial nations, and their processing capacity doubles every two years. Of the world's total investment in capital goods, 50 per cent goes to computers and peripherals. Yet expected growth in productivity has not materialized. White collar productivity remained stagnant during the 1970s and 1980s at some 0.9 per cent per year and improved in the early 1990s to 1.3 per cent — a low figure despite the announcement by Fortune magazine that "the productivity payoff arrives" (Fortune, 27 June 1994). To many observers it is unclear what causes this "computer paradox". It could be, however, that one cause is the phenomenon of "social inertia". Thus while technology has invaded aspects of everyday life to a degree believed impossible by technological experts until the 1980s, the dramatic changes in social relations that were prophesied have not materialized.

Aside from questioning the historical correctness of labelling technological and social developments as "revolutionary", there is yet another problem with this perspective. Since it binds technological and social discontinuities so strongly together, it ignores the option of a technologically discontinuous process without a social revolution. This position accepts the reality of a technological revolution and argues that there is no empirical evidence of a social revolution. Finally, one could argue that there is no way of telling which way any deep process of social change may go: the adoption of digital technologies might, for example, reinforce the pyramidal shape of social power relations; or the pyramid might flatten out, or turn upside down. No one can predict this. The essential questions thus become how we want social relations to be shaped in the future, and how digital technologies should themselves be shaped to realize this goal.
Utopian versus dystopian perspectives

Most current discussions on digital technologies are couched in terms of optimistic versus pessimistic perspectives. On one side of the debate are utopians such as John Naisbitt, Bill Gates, Nicholas Negroponte, Pamela McCorduck, Yoneji Masuda, Alvin Toffler, Kevin Kelley, Howard Rheingold and George Gilder. Utopian scenarios are put forward in the myriad business folders that announce the billion-, if not trillion-, dollar investment opportunities in the new global electronic markets. Among the critics of these technophiles, most of whom belong to the academic community, one finds authors like Herbert I. Schiller, Ian Reinecke, Frank Webster, Kevin Robins, Joseph Weizenbaum, Neil Postman, Theodore Roszak and Mark Dery. It is important to understand the suppositions underlying these two schools of thought.

The "utopian" perspective

This scenario couches its support for the deployment of ICTs in such terms as "new civilization", "information revolution" or "knowledge society", and thus subscribes to the theory of historical discontinuity discussed above. An array of positive developments are associated with the emerging information age. New social values will evolve, new social relations will develop, and widespread access to the crucial resource known as information will bring the "zero sum society" to a definitive end. The scenario forecasts radical changes in economics, politics and culture. In the economy, ICTs will expand productivity and improve employment opportunities, and will also upgrade the quality of work in many occupations. Moreover, they will offer a great many opportunities for small-scale, independent and decentralized forms of production. Finally, in the realm of culture, new and creative lifestyles will emerge, as well as vastly increased opportunities for different cultures to meet and understand each other. New virtual communities will be created that easily transcend all the traditional borderlines and barriers of age, gender, race and religion.

The "dystopian" perspective

Critical analysts reject the idea of discontinuity and stress the likelihood that ICT deployment will simply reinforce historical trends toward socio-economic disparities, inequality in political power and gaps between knowledge elites and the knowledge-disenfranchised. On the economic level this scenario forecasts a perpetuation of the capitalist mode of production, with a further refinement of managerial control over production processes. In most countries, it foresees massive job displacement and de-skilling. And finally, cultural developments will be characterized by the play of antagonistic tendencies: one toward a forceful cultural "globalization" (homogenizing all ways of life in the mould of global McDonaldization), and another toward an aggressive cultural "tribalization" (fragmenting cultural communities into fundamentalist cells with little or no understanding of different "tribes").

The debate between utopians and dystopians is not very helpful in designing policies and programmes that are intended to realize the development potential of digital technologies. The most important flaw in both perspectives is their failure to recognize the fundamental impossibility of foreseeing the future social and economic implications of technological
innovations. Since there are no valid scientific instruments to predict future social impact, it is necessary to make social choices about the future under conditions of uncertainty. The validity of our projections into the future is obviously dependent upon the robustness of the tools of inference on which we rely. Prospective technology assessment (PTA) is one of these, which is clearly seriously flawed. It is based on the supposition that harmful effects of the introduction of particular technologies can be forecast in extensive studies and consequently avoided.

Such laws may be formulated by the physical sciences for regularities in the physical environment, but there is no empirical indication that similar regularities are valid in the social environment. There are certainly trends to be observed in human social history, but these are distinct from natural laws that determine the movement of a society and thus provide a valid prediction about society's future. Trends depend upon the specific configuration of historical conditions which themselves are not unequivocally determined. It is possible to establish correlations between trends and historical conditions, but these cannot in any way guarantee that a prediction based upon them is valid.

This is related to another flaw in technology forecasting: the poverty of social scientific theory. It is possible to provide a theoretical explanation for the relationship between certain trends and certain historical conditions. However, if one refuses to accept the notion of unyielding laws in the historical process, any explanation can be contested. In fact, it is characteristic of social scientific theories that they are "underdetermined": there are always several theoretical perspectives that concur with a single empirical observation of social reality. This implies that empirical observation does not provide a way definitively to prove or disprove divergent social theories.

The explanatory poverty of social scientific theory invalidates technology forecasting, since this is based upon the assumption that a valid explanation of the modes of interaction between technology and society is possible. There is no theoretical perspective on technology and society that could provide the basis for a solid prediction about their future interaction. Given the essential contestability of theory in the social sciences, neither is there a prospect that such a prediction will emerge shortly. This fact may be disguised by the sophisticated nature of some forecasting techniques, but in the last analysis their very basic flaws make them no better than ancient astrology.

Given this situation, the choice for a utopian or dystopian scenario cannot be made on the basis of unequivocal information. With regard to the development of integrated digital networks, for example, it is equally possible to project positive effects as negative ones. The optimistic forecast sees more productivity, more employment, consumer convenience, more access and participation, and protection of vital information. The pessimistic forecast sees greater social disparity, more unemployment, more central control, more invasion of privacy and more social immobility. But neither utopian nor dystopian perspectives — both based upon a flawed assumption about predicting future impact — can guide the search for defensible social choices as these are related to the design and deployment of digital technologies.

The conclusion, then, is that it is imperative to move away from analytical perspectives that are techno-centric and determinist, that focus on historical discontinuity, and that make unwarranted claims about future impacts.
To correct these deficiencies, an approach focusing on the "social shaping of technology" has been developed. This approach does not ignore the possibility of social impact, but stresses the dynamic interaction between social forces that shape technological development and technological innovations that affect social relations. In contrast to technological determinists, those who concentrate on the "social shaping of technology" are particularly concerned with "the social forces which give rise to particular technologies". Among the factors shaping ICTs are socio-economic, political, cultural, and gender variables, geography and market forces.

It is imperative for those who want to influence the course of change in information and communications technology, in directions that might support social development, to understand what forces shape the evolution of ICTs, and how these forces interact. This makes pro-active policies and programmes possible and allows for conscious social choice. The question immediately arises as to how policy makers can make such choices if it is impossible to predict future impact. The answer is that pro-active policy-making rests upon the design of visions for a preferred future. The inability to foresee future social impact should not stop policy makers from designing alternative future courses and deciding about their desirability. Then technological solutions must be shaped to match these future visions. In this way, policy-making can move beyond the unproductive battle between optimists and pessimists. These bands would argue, for example, about whether investments in digital technologies will or will not lead to greater economic productivity. A third position would propose that a scenario for a desirable, environmentally sustainable, economic future should include a definition of the social and institutional changes that seem to be required before digital technologies can contribute to achieving this vision.

Relying upon utopian or dystopian perspectives, the debate will get stuck between the empirical evidence that automation eliminates jobs and the evidence that automation creates new jobs. What remains — inevitably — unclear is what the eventual balance will be.

6. Social and Institutional Frameworks

If one assumes that the institutional formats surrounding the deployment of technologies are more important in shaping their consequences than technological potential by itself, it becomes imperative to inquire what kind of institutional arrangements will direct digital technologies towards social development. But policy makers tend to confront a situation in which digital technologies are adopted within the social and institutional (conceptual and organizational) frameworks and routines of yesterday. This problem is especially visible when considering issues of economic productivity and democratic participation.

Furthermore, the current shift toward the pervasive application of digital technologies spawns a wide array of new industries, such as software production, processing services, time-sharing facilities, semiconductor manufacturing, database management, and electronic publishing. This potential for new economic productivity requires an educational infrastructure that provides the knowledge and skills required for ICT-related occupations. Although there has been a considerable increase in ICT teaching in many schools and universities around the world, new multimedia tools are still widely underused or used only as support for conventional teaching methods.
There is also a dearth of solid and creative training materials catering to the specific needs of developing countries. The need for appropriate technologies geared to the special circumstances of the poorer countries has long been recognized in development economics, and nowhere is this more relevant than in the context of education and training materials. Without the adjustment of teaching methods and learning materials, the potential of digital technologies to provide new forms of employment is not likely to be realized.

However, it is not yet clear how this potential can be optimally exploited. ICTs can create ways to consult citizens about political choices, but it remains uncertain whether the political system will use this facility, when it will use it, and what it will do with the data it collects. A critical question is whether the potential can be realized within the framework of the institutions prevailing in modern-day political democracies, based most frequently upon the notion of "representation". At the core of the system, one finds not the active citizen but the elected representative who decides on behalf of the citizen. It is hard to see how the participatory potential of new forms of direct democracy can be realized within the institutional setting of representative democracy.

This is also true at the level of world politics. When a global digital highway is indeed constructed and access to it is affordable to people around the world, there are unprecedented opportunities for direct electronic referenda on decisions which affect people's lives. At least on the technical level, these possibilities for global participatory democracy are feasible options. Nevertheless, the realization of this technological potential would require that the institutions of world politics become more democratic, including a more democratic structure for the United Nations, as the conferences of the Citizens Association for a More Democratic UN (CAMDUN) have repeatedly argued. Additionally, of course, there is the problem that access to digital technologies may well remain restricted to only a part of the world population. Current digital demographics are not very promising on this score.

When considering the democratic potential of digital technologies, issues of control also arise on at least two levels. First, there is the question of whether the social forces controlling emerging digital networks will be the same that control today's major information media. If these same commercial interests supervise the digital highways, what are the chances of restoring the public political discourse that is currently in rapid decline all over the world? Will digital technologies be used for the creation of open, not-for-profit, public service spheres or for the transformation of public space into electronic shopping malls? The social and institutional arrangements that are currently proposed for the construction of a Global Information Highway do not support the public service model. They are to be privately funded, corporately controlled and market oriented. (It should be noted here that even the common metaphor for the global digital grid — a "highway" — reflects the tendency to deploy the technologies within a conventional conceptual framework.)

Digital technologies will not by themselves change existing institutional settings. This will need processes of political decision-making that are guided by the genuine aspiration to bring about sustainable and democratic social development. The matter is urgent: the UNESCO World Science Report warns that the use of ICTs within conventional social and institutional frameworks may not only hamper the realization of possible benefits, but may also reinforce the possible social risks.
7. Areas for Future Action and Research

The argument presented in the preceding sections would suggest that a number of issues require new research, conducted within an action-oriented framework. The main purpose of further study and debate would be to provide policy makers in developing countries with analytical perspectives and empirical data that create a better match between technological potential and preferred futures. It is assumed that these futures should be both sustainable and democratic.

The first area could be concerned with the design of democratic and pro-active policies and programs that make it possible to realize the social development potential of digital technologies. Among other things, this entails studying:

- the roles that public and private sectors should play in the design and execution of these policies and programs;
- the forms of public intervention that are conducive to shaping technological change in accordance with desirable social goals; and
- the establishment of new and more democratic relations between producers and consumers of ICTs, so that technological progress becomes much more responsive to social needs.

A second area of concern is centred around the definition of those social and institutional changes that are required to maximize the social benefits and to minimize the social risks associated with the adoption and deployment of digital technologies. This entails considering:

- various ways of adjusting the organizational structures that are relevant for economic productivity, political participation, and cultural diversity in line with preferred social scenarios; and
- the (cultural) appropriateness of educational methods and training materials required for the realization of the technological potential.

Third, it is important to discuss the design and adoption of digital technologies that strengthen sustainable processes of social development. This involves creating digital technologies that reduce the use of energy-intensive resources and encouraging environmentally sustainable applications of digital technologies. Since conditions in different countries vary, no global solutions can be proposed in any of these issue areas. Country studies are needed in order to explore the specific policies, programmes and technological solutions likely to be effective in specific social and economic conditions.

A final area of research and action-oriented debate should no doubt involve studying the "social shaping of technology" in concrete situations. It is essential for those who want to use ICT development to further social goals to understand what forces shape technological changes and how these forces interact. This understanding would allow policy makers to anticipate social consequences better and to construct those institutional arrangements that orient technological change towards socially desirable ends. Here one must look at:

- relationships among variables affecting technological development, be they socio-economic, political, cultural or gender variables, geographical locations or market
forces. Too little is known about how these factors interact at micro and macro levels;
• the strategies through which those affected by technological development can (re)shape this development in socially beneficial ways.