The Social Implications Of Information & Communication Technologies

by Manuel Castells [from www.chet.org.za/oldsite/castells/socialicts.html – no longer available]

ABSTRACT

This report examines the social implications of new information and communication technologies in their interaction with social and economic structures, and cultural and political processes, on the basis of available evidence from around the world. It shows the emergence of a new form of social and business organization, based upon networks, tooled by communication technologies. It documents that new technologies do not cause mass unemployment, but, instead, fundamentally change labor relations and the work process, inducing flexible arrangements, and the individualization of work. In this new production system education is the key element in making possible for societies, and individuals, to reap the benefits of technology. However, increasing computer equipment is not the answer, as schools must be reformed, and pedagogy transformed to be apt to the task of educating creative, flexible, autonomous individuals. Internet does not induce a new, virtual society. Rather, it expands, and develops, existing social networks, as it helps to perform the tasks and express the affinities of those engaged in electronic communication. Empirical evidence points towards a dramatic increase in inequality and social exclusion throughout the world. Finally, the report explores the role of new technologies in transforming space and time.

AUTHOR'S BIOGRAPHICAL NOTE

Manuel Castells, born in Spain in 1942, is Professor of Sociology, and Professor of City & Regional Planning at the University of California, Berkeley. He is a member of the European Academy, and has received, among other distinctions, the Guggenheim Fellowship, the C.Wright Mills Award, and the the Robert and Helen Lynd Award.

Introduction

At the turn of the second millennium of the Christian era, societies, everywhere around the world, are being fundamentally changed by the emergence of a new technological paradigm based on information & communication technologies (ICTs). To the convergence of microelectronics-based information techologies (microprocessors, computers, telecommunications, optoelectronics), we must add genetic engineering, which extends the manipulation of information codes to the realm of the living matter, thus ushering in the most fundamental biological revolution.

Social scientists know that technology per se does not determine social processes, and institutions. Technology is a mediating factor in a complex matrix of interaction between social structures, social actors, and their socially constructed tools, including technology. But because information and communication are at the core of human action, the transformation of the technological instruments of knowledge generation, information processing, and communication, has far reaching implications, which add specific social effects to the broader pattern of social causation.

This new technological paradigm emerged as a systemic feature in the 1970s, expanded throughout the 1980s to the domains of military power, financial transactions, and high technology manufacturing, diffused in the late 1980s in workplaces of all kind, and deeply penetrated homes and culture in the 1990s, with the explosive diffusion of Internet, and multimedia. New information technologies have diffused much faster than revolutionary innovations of the two industrial revolutions. And yet, countries, cultures, and social groups, are extremely different in their degree of absorption, and utilization of new technologies. But all countries, and all people, are directly or indirectly, exposed to the structural transformation mediated by this technological revolution. Because of the speed of change, and the radical novelty of these information technologies, social sciences have been rather slow in their understanding of

the precise role of technology, in spite of a large amount of monographs that are quickly outdated by a new wave of technological innovation. Taking advantage of the necessary caution exercised by social scientits, a flurry of futurologists, and ideologues, have littered the world with simplistic predictions that usually combine technological determinism with the marketing of consulting services. This is why social sciences must take up the challenge to observe, and explain the interaction between technological change and social change without yielding to pop futurology. In this report, I shall try to discuss some of the social issues raised by new information technology, on the basis of available evidence. To remain within the limits of this report, I take the liberty to refer the reader to the analyses, as well as to bibliographic and statistical sources on this matter, presented in my recently published trilogy on the Information Age (Castells, 1996, 1997, 1998). In this report, I shall cite only sources that have not been utilized in my books, so to update current developments.

The network economy, work, and employment

Information technologies have been decisive tools in the emergence of a new economy in the last two decades of the 20th century. This is certainly a capitalist economy – indeed for the first time in human history, the entire planet is working along the lines of a capitalist economic system. But it is a new brand of capitalism. It is global, it is informational, and it is based on business networks. A global economy is an economy whose core activities work as a unit in real time on a planetary scale. By core activities I mean financial markets, science and technology, information and communication, international trade, the upper tier of high-skill labored, and mutlinational firms and networks of producers and distributors of high value added goods, and services. Our economy is informational because the capacity to generate relevant knowledge, and process information efficiently, is the main source of productivity, and competitiveness for firms, regions, and countries. And it is a networked economy, that is an economy whose units of production, distribution, and management are organized in networks. A network is a set of inter-related units that depend on each other for the performance of their common task. The networked form of economic units provides the necessary flexibility and adaptation to adjust to constant changes in demand, in technology, in process, and product, in an increasingly globalized economic environment. Networks make possible to bring together resources from different units, and focus these resources on one particular business project without losing flexibility, as it would be the case with gigantic firms organized along traditional standards of large-scale, vertical bureaucracies. The large corporation of the industrial era is no longer the operative economic unit. To be sure, large business conglomerates, particularly multinational corporations, dominate the global economy, but they are internally decentralized as networks, and they connect to a complex set of equally networked, small and medium businesses . Furthermore, large corporations and their ancillary networks build ad hoc strategic alliances, thus forming networks of networks, in an economy characterized by variable geometry. While the legal and financial unit of our economy continues to be the large corporation, the actual operation of economic activities is in the hands of a new economic actor: the network enterprise, made out of different firms, and segments of firms, and constantly redefining its structure and its components (Harrison, 1997). While capital is still accumulated by the corporation, the operating unit is the business project, and the business project is enacted by a network, constituted around this project, and ending its existence with the completion of the project.

ICTs are an essential tool allowing in for the development of the three fundamental features I have cited as characteristic of the new economy. A global economy as a planetary unit can only exist because of the worldwide infrastructure in telecommunications, information systems, air transportation, and fast transportation/delivery systems. The speed and the complexity of transactions and communication is only possible because of microelectronics-based technologies. This is why a global economy, in the sense I defined, is a new historical reality, distinct from previous processes of internationalization of the economy. Information and knowledge have always been an essential part of economic growth. But they become the dominant factors for productivity and competitiveness only when new technologies diffuse knowledge-based

information processing throughout the entire system of economic activity (Mansell and When, 1998). Production and management networks have existed since ancient times. But their flexibility was flawed by their incapacity to concentrate resources, thus losing economies of scale, and of scope. New information technologies allow simultaneously for the concentration of decision making, and for the decentralization of execution, thus solving the traditional contradiction between size and flexibility. Most dynamic economic units are made up of intra-nets linked to extra-nets via Internet. The network is the real operating unit.

This new economic forms and processes, tooled by information technology, have deeply transformed work and employment. But not in the simplistic ways which are proposed by the ideologues of the end of work's thesis. Against widespread fears according to which new information technologies would induce mass unemployment, most empirical evidence points to the conclusion that the impact of technology on employment depends on firm's strategies, economic policies, and institutional environments (Freeman and Soete, 1994). Indeed, in the late 1990s, the two economies with the most advanced technological systems, both in production and diffusion of technology, the U.S. and Japan, had by far the lowest unemployment rate in the OECD, below 4.5%. Between 1975 and 1997, during the phase of expansion of the information technology revolution, United States created 42 million new jobs, and Japan 11 million new jobs, while job creation in the European Union (12 countries) was limited to 8 million, and most of these jobs were in the public sector. Furthermore, in the U.S. the proportion of highly skilled new jobs substantially increased over time, belying the interpretation of job creation at the low end of the scale. Indeed the proportion of managers and professionals in the US labor force increased from 27.3% in 1980 to 31.9% in 1996. Martin Carnoy (1999) has analyzed the statistical relationship between job creation and various indicators of information technology for OECD countries between 1987 and 1994, demonstrating that there is no relationship between technology and employment . Furthermore, while manufacturing employment has declined in the OECD, it has dramatically increased in the world at large. There is certainly a major unemployment problem in many areas of the world, particularly in Western Europe, and in countries in economic crisis, from Africa to Latin America, and to Southeast Asia under the crisis. But it can be empirically demonstrated that new technologies are not the inducers of unemployment (Castells, 1996, chapter 4, and Carnoy, 1999). If anything, all other conditions being equal, firms of countries which do not use advanced technology are less able to generate employment than those which are better technologically equipped.

However, there is a fundamental transformation taking place in the work process, and in the labor market, and technology does play an important role in this transformation. This is the emergence of flexible forms of work, and employment that characterize economies around the world. Increasingly the model of stable, long term, employment under contract in the same, or similar, firm or administration, is being phased out. The network economy induces a great diversity of emplyment status: part-time, temporary work, self-employment, subocontracting. These flexible forms of work and employment represent already the majority of the labor force in the UK, the Netherlands, and Italy, and are progressing rapidly in the rest of the industrialized world. In Silicon Valley, the most dynamic region in the world, at least 50% of all new jobs created in the last 10 years, are in this category of flexible employment (Benner, 1999). These trends are taking place across the whole spectrum of occupational structure, among business consultants, and engineers, as well as among low-skill service workers. This flexibility is also the characteristic of most jobs of the urban informal economy in developing countries, the main source of job creation in the largest metropolitan areas in the world (Borja and Castells, 1997). Because of the growing feminization of the labor force, it may well be said that we have shifted from the organization man, which symbolized the work career of the industrial era, to the flexible woman of the information age. Information technology is a decisive factor in this development because it allows the formation of production and management networks to which individuals can be connected or disconnected according to the needs of the firm or market. Computer networks and telecommunications set up the unity of the labor process via information processing in the network, while individual workers come and go between different nodes of the production

network. The implications of these trends are profound for firms, for workers, and for the system of labor-management relations inherited from the industrial society. For firms: they will have to manage the contradiction between, on the one hand, the critical role of labor involvement in fostering productivity in the informational system of production, and, on the other hand, the limits to labor's involvement because of the temporary nature of workers' connection with the firm. For workers: their value will increasingly depend on their capacity to store specialty knowledge, and to reprogram their skills according to changing market demand, which, ultimately means education, and cultural development. For industrial relations: with the link between firms and their workers becoming increasingly loose, labor unions will have to reinvent their role, by increasingly becoming societal political actors, rather than firm-based representatives of employees, since workers are now increasingly diversifed in the universe of the network enterprise. Overall, while experts and politicians have been focusing on the misleading, simplistic assumption of the reduction of working time, and jobs, as a consequence of new technologies, the real issues are: the substantial increase of working time, and of workers around the world, spurred by the massive entry of women, and of new rural migrants, into the industrial, and urban labor force; the decomposition of the salaried employment status in endlessly changing structure of miscellaneous activities and working conditions; and the relative deteroriation of pay, social benefits, and labor conditions in most countries, as it has been repeteadly documented by the International Labour Office of the United Nations. The individualization of work, in the networked production process, is substituting for the socialization of work in the large scale organizations of the industrial revolution. The real issue for the 21st century is the social sustainability of work flexibility (Carnoy, 1999).

Education, Information, and Information Technology

The centrality of information processing and knowledge creation in all spheres of society assigns education a decisive role in tooling society, as well as individuals to be able to reap the benefits of new information technologies. But education itself is being deeply transformed by the information technology revolution. In quantity, quality, organization, and purpose. In quantity, first. ICTs are rapidly diffusing in the education system, albeit at different speed, and with different effectiveness depending upon countries, regions, and social classes. In comparative terms, the International Association for the Evaluation of Educational Achievement conducts studies on the diffusion of information technologies in schools and colleges of a variety of countries participating in its surveys. Unfortunately, the last comprehensive study was conducted in 1989, and the next one is due only in 1999. However, there are some valuable learnings from the 1989 study (Pelgrum and Plomp, eds, 1993). The US had the largest percentage (100%) of schools using computers both at the elementary and secondary level, while Japan had the lowest percentage in elementary schools (12%). However, in elementary schools with computers, Japan has as well as the lowest student:computer ratio (14:1), while in secondary schools with computers, the US had the lowest computer ratio. Which implies that Japan concentrated its computer in the best schools, while US, as well as most Western European societes, had a broader distribution of computer uses among pupils. Using the US as the most advanced society in the diffusion of computers, and communication technology in schools (together with Finland), we may pinpoint at some interesting observations, resulting from this study, as well as from more recent (National Science Foundation, 1998). In 1996, in the US, 98% of all schools have at least one PC, and 80% had 15 or more. 85% of schools had access to multimedia computers, and 64% had Internet access. Furthermore, projections were for 95% of schools to have Internet access by 2000 . While other countries, with the exception of Canada, Luxembourg, Britain, and Scandinavia, had a lower of diffusion of ICT in schools, in the late 1990s there was a rapid progression in both presence and use of ICTs in OECD countries, and, according to the World Ban's World Development Report 1998/99, in the most of the world, with Africa lagging behind (World Bank, 1998).

But, how this diffusion affects children's, and student's learning? There is a raging debate on the issue. On the one hand, most empirical studies point towards a positive effect on learning (National Science Foundation, 1998; World Bank, 1998)). However, this positive effect seems to

be concentrated in elementary schools, and special learning programs for children with learning disabilities. Furthermore, one study after another qualify the findings insisting that contextual factors (such as the pedagogic quality of the school, the family background,. and teachers' technical training) are powerful factors that, in the last resort, largely condition the potential benefits of information technology. This is why, on the other hand, there is a growing stream of critics who argue that mass diffusion of computers in the schools is happening to the expense of educational quality, as special classes, music, performing arts, and face to face interaction with teachers, are sharply reduced in favor of technology-led, computer mediated education (Oppenheimer, 1997).

Trying to argue for a balanced view, cutting across the ideologically charged debate between neo-traditionalists and technologists, it seems that the critical issue is the transformation of the school system itself, to go along with the new tools (ICT), and with the new purpose, knowledge generation, and teaching flexibility, and adaptability. To introduce more computers in a bureaucratic school system, or to provide more Internet access without knowing what to search for, or how to use the results of the search, is tantamount to inducing cognitive chaos. Thus, David Hargreaves (1998) argues for educational policies leading towards the knowledge-creating school, in a parallel move to the search for organizational excellence in the business world. This is a school in which teaching and learning are not built only around the basics of literacy and numeracy, but also include the ability to generate new skills, appropriate for tasks still in the making, and for contexts that cannot yet be foreseen. ICTs may be a major tool in transforming schools, and colleges, towards this new knowledge-creation, educational model. ICTs may extend the capacity of teachers to induce autonomous learning among the students, by concentrating the work of teachers on those tasks which require research, reflexion, and dialogue, and letting students to retrieve their own information, and learn their own ways to perform tasks in their interaction with computers. Furthermore, schools may function in networks, both intra-school, and inter-schools, allowing teachers to share knowledge and skills, so that each teacher can deepen her/his specific knowledge, and rely on the network of colleagues to complement, and share, additional information. Similarly, students may rely on a much broader field of expertise than the one physically available to them.

The network school my revolutionize distant learning, a particularly critical educational technology in higher education. Building on the Open University schemes of the industrial area, many of which were modelled after the succesful British Open University, educational institutions around the world are jumping into Internet, and interactive telecommuncations to provide full scale, specialized learning to distant student populations (World Bank, 1998). In 1998, there are 11 large open universities, each one enrolling over 100,000 students operating worldwide.Adult learning is also benefitting from advanced communication technologies, as courses become available on line, on radio, and on TV, at a lower cost, and with much higher quality. A number of developing countries are engaging in programs of adult learning monitored by youngsters, more familiar with new technologies, but more in need of the discipline that can be provided to them by the process of joint learning with their elders.

In sum, there is a positive feedback loop between information-based economy, new ICTS, and knowledge-creation schools. But for this virtuous circle to operate, the introduction of computer networks, and Internet access in the schools, is a necessary but utterly insufficient condition. Indeed, in the absence of a broader, and deeper educational reform, investment in new technologies my be wasteful at best, and disruptive at worst. The transformation of the school system to be up to the task, if we give credit to available evidence (National Science Foundation, 1998; Plomp, Anderson, and Kontogiannopoulou-Polydorides, eds, 1996), includes: the training of teachers, in both new technologies, and new pedagogic methods, which implies a higher level of education for the teachers, and, consequently, better working conditions; the reduction of class size; the networking of schools; the linkage between technological systems operating at the elementary, secondary, and higher education levels; the extension and technological deepening of distant learning, and the updating of adult education programs to fill the generational gap in

technology-generated knowledge. While it is important that 21st century's children, everywhere, feel familiar with new technologies, what is essential is that schools become able to install in their students' brains the cultural, and informational capacity necessary to use technology to retrieve relevant information, and to generate specific knowledge in an endless process of redefinition of skills, depening upon the tasks to be performed, and the context of the performance. For this, investment in technology for education, should include, as a necessary component, investment in educational technology. In other words, ICT-based pedagogy, and the inducement of the network school, are essential technologies of the Information Age, yet to be developed.

The Internet Society

Internet is in its way to become an essential communication channel characterizing the world in the 21st century. Estimates about Internet diffusion are not always reliable, and they become quickly outdated, given the speed of diffusion of Internet. With all due precautions, I think I can report estimates from reliable industry sources, estimating that at the time of this writing, in the Fall of 1998, Internet users numbered well above 100 million in the world (maybe 130 million), with 60% of them in the United States. More important is the growth rate, estimated at about 100% per year, thus reaching 500 million users in the early years of the 21st century. Earlier estimates of growth in Internet use, including my own, have been way off the mark, grossly underestimating its diffusion rate, so we should consider the reported figures as a lower limit of the projection. To be sure, Internet access is uneven, between countries, social classes, gender, and ethnic groups, with people in dominant categories vastly outnumbering those in unfavorable social conditions, in their presence in Internet. As a result of this socially biased used, Internet content reflects the preferences and values of the majority of its users. Furthermore, given the chaotic structure of Internet, the wealth of information that it offers requires considerable cultural skills (not technical) to find, process, and use relevant information.

Yet, while Internet started as a communication system for educated elites, it has already gone beyond this selective universe, and it has included a broad spectrum of people and activities around the world. As diffusion will continue to broaden and divsersify the composition of Internet society, emphasis in assessing the social implications of Internet should shift from the dichotomy between access and exclusion to the actual uses and social processes in Internet.

Everything that is in society is in Internet. Internet is an expression of society. Thus, while child pornography and hate messages widely use Internet, so does business, politics, social movements, and inter-personal communication of all kinds. Social movements, such as community networks, the Zapatistas Mexican revolutionaries, global environmental activists, or the women's movement, are in Internet, and have made Internet a key tool in fostering their causes. Thus, any reductionist view of the practice of Internet is simply belied by observation of current trends. Which are the implications of this pervasiveness of Internet as a communication medium?

The most important one is that Internet cannot be controlled, technically or politically, except by disconnecting a communication system from the global network. And this is a high price for a country, an organization, or an individual, to pay, when Internet becomes an unlimited source of information and interaction. The Afghan Taliban, or other repressive states, may be ready to pay the price in order to be able to control information. But this is not the case in most of the world, thus ending the secular power of states to impose censorship on their subjects. They may punish sources of information, but not control them. Furthermore, by linking up people among themselves, Internet bypasses the communication system established by mass media. While the media are themselves fully present in Internet, people may opt for their own communication, or for selected, alternative sources of information and interaction, thus escaping from their dependence upon mass media.

However, the pervasiveness of Internet does not imply the emergence of a virtual society that would substitute for the "real society". Futurology and superficial journalism have propagated the idea of a society on-line in which individuals link up losely in cyber-space using fake identities, and prompting artificial exchanges. In fact, sociological research, such as the series of studies directed by Barry Wellman (Wellman et alter,1996, Wellman and Gulia, 1998), or the monograph by Alesia Montgomery (1998), show that computer-mediated social networks are largely connected to people's social practices, and existing networks. This finding largely echoes the classic study by Claude Fischer (1992) on the role of the telephone in the early 20th century, expanding socially rooted social networks, rather than displacing them. A large share of Internet usage seems to happen in work situations (either in the office or at the home work desk), and reflects professional and personal interests of their users. Networks develop for specific purposes, and even chat groups are constructed around affinities, and shared values and interests. The perceptive psychological study by Sherry Turkle on identity in the Internet (1995) seems to show that there is a significant influence of the medium in inducing flexible personalities and shifting identities, as people feel freer from theis contextual constraints, and become individualized in their interaction pattern. Yet, this does not imply that new forms of communities do not emerge. If anything, available evidence points in the opposite direction. Electronic communities emerge from existing social communities, but they expand them, reinforce them, and ultimately may spur electronic communities which take a life on their own. This trend, as Wellman observes, parallels the weakening of local communities, with the advent of large scale suburbanization and the automobile, so that people use accrued mobility to cluster by affinities, rather than by their place of residence. Yet, non-locally based communities or, for that matter, electronic communities are not less real, or less meaningful than territorial communities. Thus, sociability in Internet is both weak and strong, depending on people and content of the relationship, and it is linked to non-electronic communication at various levels of intensity. In other words, there is no virtual world independent from the physical/social world. There is continuity between family life, work life, face-to-face sociablity, and electronic communication, with a pattern of interaction that combines in different forms these various expressions of sociability.

Even social and political mobilization in Internet is related to grassroots organization, and to the exercise of political democracy. Experiences as diverse as the Digital City in Amsterdam or the Seattle Community Network show the feasibility of a creative connection between locality based and electronic based communities and social movements. This connection between grassroots movements, personal experience, and Internet communication may actually prove invaluable for the reconstruction of civil society and political democracy in a world threatened by growing inequality and political alienation, as a consequence of the capture of powerful ICTs by the powers that still control society.

Inequality in the Information Age

Precisely at the historic time when new information technologies contribute to unleashing productivity and creativity, the empirical record shows a marked increase of social inequality throughout the world, both within countries, and between countries, with a few noted exceptions. If we differentiate between inequality, polarization, poverty, extreme poverty, and social exclusion, using the data sources reported by the United Nations Development Program in its annual reports, we find the following pattern (Castells, 1998; Massey, 1996): Global inequality has dramatically increased in the 1980s and 1990s, in spite of the progress of newly industrializing countries: between 1960 and 1991 all but the richest quintile of income distribution saw their income share fall, so that by 1991, more than 85% of world population received 15% of its income. During the 1990s, development processes, while improving standards of living in some areas of the world, particularly Asia, South America, and the United States, were characterized by increasing inequality, as the upper income levels benefitted disproportionally from economic growth. Polarization, that is the simultaneous growth of income and assets at the top, and decline of income and assets at the bottom, has increased considerably: the ratio of top 20% income groups to the lower 20% jumped from 30:1 in 1960 to 78:1 in 1994. In 1993 the assets of world's

385 billionnaire individuals exceeded the combined annual incomes of countries with 45% of the world population. Extreme poverty has also increased: in the mid-1990s, about 1/5th of humankind survived with less than one dollar a day. Poverty also continued to be widespread, with another 1/5th of humankind getting by with an income between one and two dollars a day. However, in the first half of the 1990s, the global proportion of people in poverty decreased, as a result of favorable development processes in China, India, Southeast Asia, and parts of Latin America (particularly Chile, Argentina, and Colombia). However all indications point to the fact that the 1997-99 Asian crisis has dramatically worsened living conditions, and increased poverty, and inequality in Asia, particularly in Indonesia, reversing the gains of the prior decade. Social exclusion refers not only to inequality but to the social disenfranchising of some social groups, as they are marginalized by lack of employable skills, systemic discrimination, undocumented status, illness, drugs and alcohol, homelesness, and family disruption. Social exclusion is a rampant phenomenon in most of the world. Perhaps the most blatant case is that of the United States, where, for instance, 2.8% of the adult male population is under the jurisdiction of the criminal justice system. Country studies of income and assets inequality show the widespread increase of inequality during the 1980s and 1990s in most countries, particularly in the U.S., and the UK in developed countries, and in Mexico and Brazil among the industrializing nations. Only Scandinavian societies, and East Asian developed countries, particularly Taiwan and Japan, resist the trend towards increasing inequality. On the other hand, polarization, has increased everywhere where the phenomenon has been observed, with the exception of the US in the 1996-98 period. Furthermore, poverty and social exclusion are territorially concentrated within countries, thus creating zones of exclusion that make more difficult for their dwellers to escape from poverty (Massey, 1996).

However, observing global trends towards increasing inequality, polarization, and social exclusion does not necessarily imply that new ICTs are reponsible for them. Indeed they are not, as technology can be put to many uses, and in fact, properly utilized, could help alleviate poverty, and correct inequality. Yet, I contend that the particular framing of ICTs in the context of global, informational, and increasingly de-regulated capitalism, has been a major factor in the increase of inequality and, particularly, of social exclusion. This is why:

The flexibility and global reach of the new system means that in the global system of production we find at the same time very valuable, productive individuals, and groups, and people, who, from the perspective of dominant economic interests, are not valuable, or become devalued. The network form of organization allows to connect and disconnect people and places without disorganizing the system.

Education, information, science, and technology, become critical for development of countries, firms, and people (World Bank, 1998). These factors depend on societies' cultural/educational capacity, and thus become increasingly unevenly distributed. To be true, an unprecedented proportion of children are now scholarized, but the proper word, in many cases, would be warehoused, since school systems crumble under the lack of resources and proper training for impoverished teachers. While there is wide diffusion of technology around the world, there is no corresponding rate of diffusion of the educational capacity to handle new ICTs.

Networking and individualization of work leaves workers to themselves. Which is all right when they are strong, but becomes a dramatic condition when they do not have proper skills, or they fall into some of the traps of the system (illness, additions, psychological problems, lack of housing, or of health insurance).

The mass incorporation of women to the paid labor force, under conditions of structural discrimination, together with the crisis of patriarchalism, as men try to hung on to their privileges, has led to the widespread feminization of poverty.

The traditional sources of discrimination, particularly gender and racial discrimination, are reinforced by restricting access to the best uses of new ICTS. Thus, studies on the U.S. show that low-income communities, particularly those inhabited by ethnic minorities, had much lower exposure to ICTs, and less ability to use new technological tools for their own development (Schon et alter, 1998). Juliet Webster (1996) has analyzed, on the basis of European data, how women's entry in the labor force is at the same time favored, and downgraded by ICTs. On the one hand, women take advantage of new opportunities in the information processing industries. On the other hand, they are systemically placed in a professional role below their education, and skills. Networking allows increasing responsibility of women workers, not de-skilling them but using their skills without corresponding compensation. Studies on developing countries presented at the 1998 International Telecommunications Union conference show the large gender gap in access to telecommuncations and computers, in favor of men, so that women are the least connected . In the U.S., in 1997 while 29.4% of households composed by married couples with children had on-line access, and 57.2% owned a computer, the respective proportions for single parent, female headed households, was of only 9.2% and 25%. In sum, technological discrimination adds to the traditional sources of discrimination by gender, race, level of development, and rural/urban bias. And because technological access is essential for improvement of living conditions and personal development, ICTs deepen discrimination and inequality in the absence of deliberate, corrective policies.

The crisis of the welfare state, induced by globalization and by neo-liberal economic strategies, has reduced the safety net in most countries. Cuts in public spending imposed in many cases by global financial markets, and international financial institutions, reduce the chances for people to make individual transitions to the new production system.
Thus, ICTs are not at the source of growing inequality and social exclusion. But their biased utilization by a dynamic, de-regulated, global capitalist system has triggered processes that seem to lead, around the world, to increasing social inequity in stark contrast to the promises of the Information Age.

The transformation of space and time

We may consider that a process of historical transformation is taking place when social and technological trends profoundly affect the practice, and the social construction, of space and time. Thus, the industrial era ushered in widespread urbanization and communication linkages between distant places, to form cities and metropolises as the backbone of national economies. It also made clock time the dominant pacer of our work and our lives. It can be empirically argued that a transformation of similar magnitude is taking place at the dawn of the Information Age, which is characterized by the emergence of the space of flows, and of timeless times, as the new frames of our social practices.

New ICTs have made possible to link up, in real time, or programmable time, activities located at great distance. The global economy is precisely constituted by processes of investment, production, management, and distribution, that work as a unity, on a daily basis, across the country or across the world. Financial markets are based on telecommunicated information systems that obliterate boundaries. Media systems are interconnected, linking up global and local in the production and distribution of information, sounds, and images. Internet functions as a global network of horizontal communication, allowing interactive exchanges regardless of distance, albeit not of location (because access is commanded by location). Telecommunications, information systems, fast air, land, and sea transportation, allow for reuniting activities overcoming geographic limits. However, as empirical observations has demonstrated the end of distance does not lead to undifferentiated location patterns or to the end of cities (Castells, 1989; Graham and Marvin, 1996). We are in fact witnessing the largest wave of urbanization in human history, particularly in Asia and in Latin America, with the formation of megacities which concentrate an increasing proportion of population, wealth, technology, information, and power. The space of flows is made of networks that connect territories which are spatially distant. Thus,

there is at the same time, spatial concentration and decentralization of activities and human settlements. Yet,. the functional connections do not follow the pattern of spatial proximity, but the logic of the dominant interests circulating in these networks. Thus "the global city" is not one, or several, major cities in the world, but a composite space made of bits and pieces of New York, London, Tokyo, Paris, Frankfurt, but also of Buenos Aires, Mexico, Sao Paulo, Hong Kong, Singapore, and of locales harboring dominant economic/information activities in any major urban center anywhere in the world. The space of flows links up distant locales via telecommunications and transportation networks, enclosing them in a global space, while segmenting these locales from other nearby territories in their metropolitan areas. Inside metropolitan areas, there is considerable decentralization of population and activities along transportation axes, so that the whole system is characterized by spatial sprawl, and networked communications, in a sort of intra-metropollitan space of flows. This is precisely what explains the formation of metropolitan areas of unprecedented size, the metropolitan regions, which concentrate an increasing proportion of population on the basis of the ability of communication systems to link these areas internally, and to connect the whole area to other areas around the world (Borja and Castells, 1997). The variable geometry of networked integration and switched off exclusion of the network society translates into the juxtaposition between two spatial forms/processes: the space of flows, on the one hand, the space of places, on the other hand. People still live in places, and construct their experience, their meaning, and their political representation around these places. But power, money, and information are primarily organized around flows which link up distant locales, and unite them in a shared logic. The structural disjuntion between space of flows and space of places seems to be a central feature of the Information Age.

A new form of time is emerging as well, induced by new ICTs: timeless time (Castells, 1996: 429-468). Chronological time of the industrial era was based on predictable sequencing. Electronic communication systems allow time compression to the limit, as in split second transactions in global financial markets. Yet, the current effort towards annihilation of time does not stop in the accelerated circuit of financial flows. It can also be witnessed in the instantaneity of communication, in the global media network. Or else, in the practice of "instant wars", as technology allows to design war making about short, devastating strikes that settle domination in a few days, hours, maybe minutes, thus circumventing public opinion's reluctance towards the violent exercise of power, and, even more, against personally suffering the consequences. One form of emergence of timeless time is time compression. The other is de-sequence, breaking the ordering of predictable patterns of events. This can be observed in the end of predictable work career patterns, as men, and particularly women, go back and forth between work, home, and education, and between different working schedules, and between different roles in the work process. Or in the emerging process of breaking down of the biological reproductive cycle, as some women are set free to choose the time and conditions of their reproduction, and as new technologies allow for the time and bodily separation between insemination, fertilization, and pregnancy. Furthermore, information and cultural representations are increasingly enclosed in an electronic hyper-text which integrates, through links, and interactive referrals, audiovisual media, Internet communication, printed media, and the whole range of digitized information. In this flat information landscape, sequencing disappears, as the possibilities of recombining, and re-sequencing messages in a new text are endless (Croteau and Hoynes, 1997). Sequential time vanishes, inducing an eternal communication pattern, since disappearance of time is tantamount to eternity.

As with the space of flows, timeless time does not exhaust temporal experience in our society. In fact, most people organize their practices around clock time and biological time. Yet, dominant activities, and dominant social groups, tend to evolve around timeless time, made from the combination between time compression and de-sequencing of social practices. If this is counter-intuitive to the vision of the executive class constantly rushing against the clock, at a closer look this observation seems in fact to be coherent with this analysis: what can be more stressful than the personal effort to reject time limits in performing their lives?

The contraditions between space of flows and space of places, and between timeless time and chronological and biological time, signal a fundamental cleavage in our societies and in our experience.

Conclusion

If there is a sentence that would capture the essence of the current empirical record on the social implications of new ICTs it probably would be that there is a dramatic gap between our technological overdevelopment and our social underdevelopment. Because of the power of new technologies, trends which are rooted in the organization of societies become extraordinarily amplified, so that, overall, we seem to be heading towards social and economic crises of unprecedented magnitude, instead of collecting the harvest of human creativity. Some of these trends are related to the new brand of de-regulated, global capitalism that emerged triumphant from its historic confrontation with statism – only to be faced by its own contradictions and systemic flaws. But capitalist greed is not the whole story. Deep-seated sources of discrimination and social exclusion, such as racism, patriarchal sexism, xenophobia, religious fanaticism, extreme nationalism, are also contributing to the deviation of the power of technology towards enhancing the technology of power. Furthermore, institutional weakness of political systems, and the widespread crisis of ethical values in most of the world, may be inducing an even more dramatic confrontation between the products of human ingenuity and human life. The revolution in genetic engineering, an information technology after all, is putting in our hand the power of alter, manipulate, and ultimately create life. As regulatory institutions and ethical controls break down in most realms of actitivity, we should not expect much enforceable restraint in the conduct of this new technological adventure. The extroardinary potential of the biological revolution to cure illness, and feed an still starving world, may go hand in hand with the dark side of the Information Age: after conquering the power of life and death over our own species, we may well follow our death wish.