Globalization and technology: how will they change society?

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Abstract

Globalization, digitization, and biotechnologization are integrally connected in this new millennium. Globalization and technology share a causal relationship, each gaining from and building on the other. Digitization, the “bones and sinews” of globalization, has taken our lives out of the temporal and into the imaginary and unseen. Reality is no longer defined in terms of things we can see, feel, and measure; now reality is defined by ideas and by the ability of people to generate and communicate ideas. Added to these components is biotechnologization, an outcome of technology, whose global impact is measured by its usefulness — and threat. All three factors form a trinity of promising yet potentially malevolent possibilities. © 2002 Elsevier Science Ltd. All rights reserved.

1. Introduction

Globalization is here to stay. We are not going to reverse the trend (Roy MacLaren, Canadian Ambassador, in London, Nov. 5, 1998).

Globalization is much more than the worldwide production and consumption of products [1]. It is not just an economic or cultural trend but a movement of ideas, lifestyles, and developments that could affect our families, our employment, and the future of the world. Some view globalization negatively, i.e., as the force that collapsed one after another of Asia’s economies in quick succession, or as the force...
that brings uninvited cultural influences into a country newly exposed to foreign media and the Internet, or as the force that many predict will bring about human annihilation through accelerated inter-nation conflict in the future. Others tout the benefits of globalization: its power to enable rescuers to reach flood and earthquake victims hours after a tragedy occurs, its capability for empowering handicapped citizens, and its potential to create educational opportunities even for those in the remotest areas. Thus, globalization is neither a Pandora’s box nor an Aladdin’s lamp but a series of causes and consequences mediated by human choices.

2. Global trends in technology

A number of global trends can be seen as technology continues to expand. Among these are: greater diffusion, faster development, greater emphasis on commercial value, greater diversification, and increasing standardization.

2.1. Greater diffusion

2.1.1. At the national and international levels

Global trade connections will act as a wedge, enabling economic activity in new areas. Access to new areas will be opened even further through transportation and communication connections that link every area to the rest of the world. Technology will be diffused worldwide via rapidly expanding world market connections. Supporting this global dispersion of technology will be a massive network of telecommunications equipment and services. Sales via the electronic network have jumped from $788 billion in 1995 to the trillion-dollar mark in 1998 [2]. Experts predict sales in communications technology to grow 7% per year, double the rate of world economic growth. Backing the momentum of free trade and telecommunication will be global agreements such as the World Trade Organization’s (WTO) International Telecommunications Agreement (ITA) and Trade Related Aspect on Intellectual Property (TRIPS). Such agreements will facilitate the merging of all markets into one massive global market. This, in turn, will spur increased use of telecommunications products and services.

Other types of networks will web the world’s economic systems together. For example, unrestricted finance and investment activities, including the free exchange of production factors and labor resources, will help to blur traditional geopolitical lines of demarcation. Technology diffusion will cause manufacturing to take on new dimensions, allowing easier expansion into overseas markets and smoother import of production technology. Machinery, parts, and production know-how will be carried by highly trained personnel to every corner of the world. Already economic alliances are tearing down political boundaries. Geopolitical divisions are increasingly thwarted by free trade zones, economic agreements, and economic groupings such as investment agreements by the WTO and Multilateral Agreement on Investment (MAI) members of OECD. The conditions of these agreements stipulate that foreign investors be allowed equal access to local markets. This condition will have
heavy repercussions on the global economy, accelerating the growth of foreign investment and, of course, furthering the diffusion of technology.

Transportation and telecommunication networks have grown in response to the development of transportation facilities, transportation technology, and international communication technology causing the rapid transfer of expertise, equipment, and personnel. However, the influence of globalization will extend much further than economic and political considerations alone.

2.1.2. At the social level

Globalization will enable digital technology and biotechnology to shape society for several reasons. First, an “open society” will become dominant in many nations. Data and images transmitted around the world will bring momentous changes in social and cultural structures. Local traditions are being subsumed by a dominant global culture, a “global lifestyle,” that is found in the most powerful economic countries. The foundation of this lifestyle — its dietary patterns, employment preferences, education system, healthcare structure, social behavior, national defense configurations, political structures, governance practices, etc. — will be technological innovation.

Second, capitalism will drive technology forward. As a fundamental component of capitalism, competition among producers benefits consumers who seek products and services that have the highest quality at the lowest price. As people enjoy the benefits of a prosperous economy, they become exposed to information about economic opportunities in other places and they demand access to a higher standard of living, including machines of convenience, quality food, and better healthcare services. Responding to these needs results in digitization and biotechnologization.

Third, stronger global trade regulations will erode the protective abilities of national trade tariffs, thereby resulting in more intense competition, especially from mega-corporations with better technology resources. Medium and small-size businesses will be forced to adjust in order to survive. Businesses will upgrade their production efficiency by either developing their own technology or importing it. Thus, in the next decade, both digitization and biotechnologization will be important factors governing the global economy. And both factors have great potential for increasing effectiveness and productivity.

2.1.3. At the individual level

Globalization will also cause great diffusion of technology at the personal level, resulting in greater individualism and self-centeredness. Business has already embraced this trend by “making the customer king.” Digital technology enables businesses to respond immediately to specific consumer needs. Even the media is following this trend. New technologies are being tested that will enable individual viewers to escape conventional television scheduling, and instead be able to order at will a movie, a game show, the news, or a documentary. Digital sensors in electronic products, such as software programs and microwave ovens, will track customer behavior patterns and use the information to cater to customers’ specialized needs. Other sen-
sors will relate operating information from household or office equipment to the manufacturers. 

Competition will bring about major advances in corporate efficiency that will result in lower production and service costs. Previously, digital technology and biotechnology were considered high-level technology, meaning that they were accompanied by high price tags. They were restricted to scientific or technological research settings in development labs, government organizations, or large private organizations. However, the price of new technologies will fall as further developments make them available to general consumers. The number of commercial applications for high-tech personal products and services will grow.

During the past two decades, the cost of international telecommunications has dropped significantly. For example, equipment and installation costs per voice path on the trans-Pacific route fell from $73,000 in 1975 to only $2,000 in 1996. By 1999, costs fell to less than $200 and are expected to fall to $5 in the early years of this new millennium [2].

2.2. Faster development

Technology will continue to grow at an accelerated rate. Knowledge is expected to change as much in the next hundred years as it did in the previous 3,500 [3]. There have been rapid changes in IT innovation, one of the most notable being the silicon chip which has significantly accelerated innovation and processing speeds. Consider the so-called Moore’s Law, which asserts that “computer power doubles every 18 to 24 months”\(^1\).

Innovations in production will also occur more rapidly than in previous ages. The world has become a global village connected by high-tech communication and rapid transit systems, and this has caused tremendous diffusion of knowledge. The exchange of information, concepts, expertise, and new knowledge will have fewer boundaries, thus leading to an even quicker accumulation and exchange of knowledge. Increased information should also facilitate growth in the information-to-knowledge-to-wisdom process.

The mass media is becoming ever more important in the world. For example, traffic on the Internet has been found to double every six to nine months. In 1999, the number of linked Internet host computers comprising the Web was 43.23 million [4], up from less than one million in 1993. Installation of international fixed lines expanded 15% per year between 1990 and 1996, resulting in doubled usage during these years. In 1999, 38% of all businesses in the US use high technology, including the Internet and mobile phones. There was a 533% expansion in the public use of the Internet for research purposes in the year 1999 [5]. Intense competition will put even greater demands on telecommunication products and computers.

\(^1\) This so-called “law” was first stated in 1965 by Gordon Moore, co-founder of Intel Corp. It is not a scientific law but a rule-of-thumb which has uncannily predicted the evolution of computer power for several decades.
2.3. *Greater emphasis on commercial value*

Technological development will occur more quickly in the private sector than in the public. Increasing numbers of competitors will push prices down and narrow profit margins. R&D will shift from academia and the government sector to the private sector. Because of greater financial resources, private enterprise will develop greater long-term research continuity. A world investment report estimates that pharmaceutical development will eventually be centered in a few business groups, far less than the seven that presently control a quarter of the global market. Similar mergers will occur in the digital technology industry where five or less mammoth organizations will control the global marketplace.

2.4. *Greater diversification*

As a result of globalization and increased competition, technology will become centered in two groups: (1) a few large businesses that control major market share, and (2) many small businesses that will compete by identifying and quickly adapting themselves to niche markets and developing specialized technologies.

2.5. *Greater integration*

Globalization will cause states, institutions, and business organizations to merge into one society. Likewise, technology networks will become increasingly clustered into a few major groupings and supra-state economic organizations.

Cooperative efforts and connections among similar types of businesses will increase. For example, educational institutions will merge to provide comprehensive educational services. Stimulated by heavy competition, businesses will gain comparative advantage by forming cooperative networks and business alliances to provide complete “one-stop” service. In addition, greater use will be made of interdisciplinary technologies, such as “biocomputers” where living nerve cells are integrated into computer circuitry [6].

2.6. *Increasing standardization*

The number of global-level regulating organizations to control natural resources, the environment, health care, ethics, and so on will rise. More stringent international trade standards will be set by the most economically powerful nations. Products entering the international market will have to meet these global standards, which will also be imposed on development and production technologies. Green technology, environmental safety, and environmental law will acquire greater emphasis in the future.
3. The impact of technology in our lives

Technology is expanding faster than any known biological entity. Lifestyle and human social behavior are responding much as they did to all other waves in human history — with great difficulty and, at times, in unexpected ways. Significant changes are currently shaping human societies.

3.1. A common worldview

The expansion of technology has already and will continue to bring about significant and profound changes in the human perspective. The number of assumptions that can be designated as worldviews (defined as the dominant perspectives that people as a collective hold) constantly increases, and they affect our lives in profound ways. Advances in technology carve deep and long-lasting channels in the social terrain in which we live.

Actually, technology itself cannot directly shape people’s worldviews. Instead, worldviews are derived from the concepts and philosophies that configure the mind of the inventor of a particular technology. Thus, new concepts and views occur independently in society, but technology helps to pull individual or small group perspectives toward a global orientation. Technology magnifies the impact of a particular worldview by multiplying and dispersing it to a wide audience. The increasing occurrence of an idea may not cause it to be more popularly accepted, but ease of access via the Internet means ideas that were previously available only to a limited audience now have the potential to become available to anyone with Internet access. Technology has thus become a defining agent of change. Digital technology and biotechnology will change people’s worldviews in several ways.

3.1.1. A more commonly accepted worldview

The perspectives of our world’s many societies will eventually be unified into one global worldview. Information networks and telecommunication technology will ensure that everyone receives the same images and influences, thus shaping worldviews by global currents of post-modernism, materialism, consumerism, individualism, and capitalism, among others. Modern technology is helping to transmit these views to every culture, resulting in a set of commonly accepted thoughts, values, deeds, and emotions espoused by an increasing number of people.

The instruments used to create this unified worldview — computers and telecommunication technology — increasingly determine our future. Today technology and technology leaders, especially those from developed countries, determine changes in worldviews and thus they wield the power to drive the societies and lifestyles of those receiving the technology, i.e., the people in developing and undeveloped coun-

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2 “Worldview” is the pattern or frame of thinking held by every person which determines the values, behavior and feelings of that person. Each worldview is like a pair of glasses with colored lenses. Each person has a different set of glasses that makes them see the world in a different color.
tries [7]. The result is that new worldviews become the building blocks of future societies.

3.1.2. A worldview created by individuals

Worldview affects more than groups and societies; it shapes the outlooks of individual members of these groups. After all, not all individuals share the same set of assumptions as the other members of their group, and technology can color the perspectives of individuals in a variety of ways.

In the future, studies will be more individualized, especially for students in developing nations where today curricula are highly prescriptive, public libraries are largely inaccessible, and learning opportunities considered “normal” for children in the developed world are unavailable to a high percentage of students. Students from developing nations will have greater choice over what they learn. Information technology as a means of free exploration will have a greater impact on the education of young children than traditional education modes, where knowledge is dispersed en masse by a teacher to a group of students.

Digital technology will allow greater individual selection of media forms. For example, Internet browsers can select the site and the depth to which they penetrate that site. Communication technology will facilitate mass communication by and among individuals. And whereas mass media communication was previously limited to a uni-directional mode, it has now become bi-directional. Each visitor receives a different blend of information, thus creating personal worldviews that are differentiated for each visitor. TV science show host, James Burke, stated,

Institutions are lamentably unready for the inevitable emergence of a new, technology-generated phenomenon — the empowered, informed individual

[8]. Modern technology has enabled people to become individuals.

Information technology has become the instrument that facilitates not only the formation of the individual but also the formation of group identity. Even views held by the most offbeat and socially unacceptable groups take on some air of legitimacy on the Internet. This tool empowers individuals to communicate their ideas and gain the cooperation of other individuals with similar interests. In the future, subculture groups may gain credibility and thus increased bargaining power within society. Via the Internet, they are able to propagate their views to the world. Thus, groups with advanced technology can use it to magnify, sometimes exponentially, the membership base and influence of their group. Included in this trend is a growing wave of popular democracy whereby subculture groups are allowed free expression of their opinions through various electronic channels.

3.1.3. A worldview that allows a multi-dimensional perspective of truth

The development of technology has caused an interesting shift in the global perspective of truth: from an absolute entity to one that can change with time, circumstance, or new scientific discovery. Accompanying this degeneration of truth into relative terms came an ethical framework that was more tenuous in nature; that is,
the dividing line between right and wrong became increasingly blurred. As with technological developments of the past, such as Nobel’s dynamite, questions of the short- and long-term implications of such innovations are rarely asked beforehand. Legal and moral dilemmas surrounding groundbreaking technology are at times left hanging, as people are hesitant to judge the outcomes of innovation. At other times, technology has advanced so rapidly that people have little time to understand and develop definitive ethical stances. In the future, confusion and ambiguity may characterize many areas of society, from public policy to personal choice. When ethically ambiguous issues arise, many people could conclude that absolute truth does not exist and make decisions according to their own dictates.

Truth may be obscured by a profusion of information. The growth of information networks will allow people to disperse personal ideas on millions of Websites. The resulting flood of information, sometimes of questionable quality or validity, could produce an information “overload.” Increased time pressures could cause people to cluster issues together and make umbrella decisions. As a result, we might see decreased acknowledgement of truth as absolute.

3.1.4. A worldview that allows greater selection

Biotechnology, especially genetic engineering, may enable people to clone living cells and form genetically identical organisms. Genetic engineering originally was used to design plants, animals, and microorganisms that were stronger and more commercially viable. Today new, genetically enhanced crops and herds are increasing the world’s food production capabilities.

Technology is now used to override the so-called “laws of nature,” including some of nature’s selective processes. Instead of awarding survival to the strongest and most able, technology places control over survival and success in human hands. For example, technology has placed the power to create life (eugenics) or to terminate it (abortion and euthanasia) in the hands of doctors and medical boards. Now technology is taking a larger role in determining “the fittest” — those with access to the best technology, and the “unfit” — those denied the benefits of technology.

3.1.5. A worldview that controls rights over life

Technology has heightened our awareness of personal rights. This trend is especially common in the case of biotechnological innovation. Breakthroughs in scientific research have supported the mindset that technology, and thus we as the originator of these genetic technologies, can control the formation of life in general and human life in particular. Various issues are being raised around, for example, the right to use personal genetic material in research and production, the right to use personal genetic material to clone, the right to commit suicide, the right to use addictive substances, and so on.

3.2. New social patterns

Digital and communication technologies may mold social paradigms and influence social stratification in the coming twenty years.
3.2.1. Virtual relationships

Digital technology allows people to give efficiency and convenience a higher priority than before. Face-to-face meetings may be replaced with digital interfaces [9]3. For example, as education adopts more technology, the social implications of having an education may be redefined. Recently, a network of universities joined together to form a “campus-less” National Technological University (USA). It will be an important test case to see how virtual universities and remote education might fare in the future.

Shopping is also affected by the technology revolution. Even though e-commerce has functioned seriously only since 1995, already a rapid growth curve and increased e-commerce market share can be seen in total world retail sales figures (see Table 1). Several experiments are being conducted to determine if individuals can survive in isolation, communicating with the outer world only via the Internet [10]4.

Other daily activities increasingly are being governed by high technology. People can access, via the Internet, the resources of many of the world’s major libraries, as well as banks, movies, bookstores, information polls, election results, central bank figures, and even military archives. Even some traditionally private sites, such as the birthing rooms of hospitals, have been opened to some public view as a result of Internet technology. In the future, it is likely that social interactions will be determ-

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Comparative estimates of e-commerce sales</th>
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<tbody>
<tr>
<td></td>
<td>E-commerce estimates (US$ billion)</td>
</tr>
<tr>
<td>Past(1996/97)</td>
<td>26</td>
</tr>
<tr>
<td>Near Term (2001/02)</td>
<td>330</td>
</tr>
<tr>
<td>Future (2003/05)</td>
<td>1000</td>
</tr>
</tbody>
</table>


3 This article reported that 21% of Indonesians, 20% of Indians, 18% of Singaporeans, and 17% of Taiwanese say they spend less time with family and friends today.
4 This article describes a week-long existence through a Net umbilical chord. Dot.com Guy, Mitch Maddox, will live for a year on the Web.
ined by technological patterns and precedents that have been established by the di-
gital nature of modern telecommunications.

Although high technology is efficient and caters to the human predilection for con-
venience and ease, it cannot replace the desire for face-to-face contact. While ad-
vances in technology will undoubtedly create more opportunities for communi-
cation on a horizontal level, such advances might also limit opportunities for de-
developing in-depth relationships. For example, many people who become friends
over the Internet often decide to meet in person. And despite the growing number
of “Net romances”, where people decide to marry based on Internet interactions
without ever having met face-to-face, no one has ever agreed to a “virtual marriage,”
although some may try it in the future.

Even so, modern societies have produced an increasing number of people who
are more antisocial [11]. Individualism and inherent human laziness may allow tech-
nology to limit the quality of human relationships. The feeling of power attained by
acquiring additional knowledge may reduce the yearnings for interdependence with
other people. Technology may also be used reduce certain competitive pressures
found in some social situations. Trends point to greater self-reliance and a resultant
distance in human relationships.

3.2. Deviation from social norms

Changes in the dynamics of relationships can be traced to the extension of tech-
nology and information systems to the individual level. Information is no longer
limited to leaders but is, to a large extent, now available to the general populace.
Technology opens societies and exposes people to new information, which inevita-
bly changes their worldview, thinking, and values. Traditional social patterns of mar-
rriage, family, community, and society are being replaced. The definition of the family
will change as genetic engineering makes conception possible for infertile couples,
enhances opportunities for single parent families, and creates other relationship con-
texts that might earlier have been considered impossible.

3.3. Changes in personal privacy

The growth of democracy and the human rights movement has resulted in greater
demand for personal rights and freedoms. Despite this, both the public and private
sectors continue to violate personal rights and freedoms through various methods
used to obtain personal data. National intelligence departments and other organiza-
tions use high-tech equipment to elicit personal information from both domestic and
international sources, ostensibly for purposes of national security and/or other
reasons. The private sector is no better. Complicated competitor and customer inform-
ation is seen as vital to the development of new production processes and expansion
of market share. Personal information is derived in different ways, such as electronic
identification (iris scanning, DNA sampling, electronic fingerprinting, and electronic
vending cards), linkage of personal computer and Internet system, bar-code systems,
remote video recorders, satellite photographs, phone taps, and other machines are
being used for personal surveillance.
Many Internet Websites track information on the personal browsing habits of Internet users. More than half of businesses using Websites do this without posting a privacy disclosure statement (Table 2). It is expected that gathering personal information in this way will likely increase in the future. According to forecasts, by 2013, 75% of the world’s population could be electronically identified. In the society of the future, all personal transactions done on the Internet may be recorded and the information stored. Privacy in that sense will no longer exist.

4. Social problems and conflicts provoked by advanced technologies

In his theory of cultural lag, Ogburn [13] suggested that social institutions need time to adapt to major technological changes. Today technology is advancing faster than human history has ever experienced. The possibility that societies will not be able to adjust to these changing technologies is highly probable. In the future we could see the rise of two types of problems.

4.1. Ethical dilemmas

Ethical controversies may continue to surround developments in biotechnology and genetic engineering. Conception and contra-conception technologies, the creation of new life forms, and other related issues, will be more present in the public conscience. The uncertainties of reproductive medicine could continue to raise ethical questions. The key task is to supplement medical or economic decisions on geneti-

Table 2
The Online Privacy Alliance: a comparison of GIPPS and OPA surveys

<table>
<thead>
<tr>
<th></th>
<th>GIPPS Report*</th>
<th>OPA Study**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of sites in sample</td>
<td>361</td>
<td>100</td>
</tr>
<tr>
<td>Number of sites collecting personal information</td>
<td>337</td>
<td>99</td>
</tr>
<tr>
<td>Percentage of sites in sample collecting private information</td>
<td>93%</td>
<td>99%</td>
</tr>
<tr>
<td>Number of sites disclosing any private information</td>
<td>238</td>
<td>93</td>
</tr>
<tr>
<td>Percentage of sites in sample disclosing any private information</td>
<td>66%</td>
<td>93%</td>
</tr>
<tr>
<td>Number of sites posting a privacy policy notice</td>
<td>157</td>
<td>81</td>
</tr>
<tr>
<td>Percentage of sites in sample posting a privacy policy notice</td>
<td>44%</td>
<td>81%</td>
</tr>
<tr>
<td>Number of sites including a disclosure for all four substantive fair information practice principles</td>
<td>36</td>
<td>22</td>
</tr>
<tr>
<td>Percentage of sites in sample including a disclosure for all four substantive fair information practice principles</td>
<td>10%</td>
<td>22%</td>
</tr>
</tbody>
</table>

* Georgetown Internet Privacy Policy Survey (GIPPS) studied 361 dot.com Website visits by at-home consumers drawn from a sampling of the top 7,500 URLs, ranked by audience, during January 1999.

** Online Privacy Alliance (OPA) study was based on a census of the top 100 dot.com Website visits by at-home consumers drawn from a sampling of the top 7,500 URLs, ranked by audience, during January 1999 [12].
cally engineered intervention with ethical criteria. Despite the fact that genetic engineering has produced insulin and high-yield agriculture crops, the world cannot ignore the implications of genetic engineering — a problem of control in view of the speed of development in genetic research. “People made-to-measure” is one scenario that could heighten the potential for conflict in the future.

4.1.1. Devaluation of people

Advances in digital technology and biotechnology may lead to placing less value on certain people within future social frameworks. For example, those whose jobs are replaced by intelligent robots might view themselves as being less valuable than a machine.

Changing definitions and perimeters on human value such as these could be especially evident in technology that deals with the starting point, the creation of life. The possibility of cloning humans seems to be drawing ever nearer. But cloned people, lacking unique personal traits, could feel they are no different than the products in a supermarket or factory. Biotechnology may cause us to value people with “good genes” over those with “bad genes,” akin to the belief existent in many Asian cultures that criminals have “bad blood.” Such devaluation of people could place new pressures on society, causing people to treat each other with little or no consideration or compassion. People who have lower abilities to create economic value within society could be deemed less useful. Society may begin to accept conduct and behaviors that dispose of economically unprofitable people. For example, much literature justifies abortions by claiming that the parents are not economically capable of caring for children; euthanasia is validated because of the costs it saves the medical care system. People could look for excuses to abandon elderly or handicapped family members. Life may be judged only by its economic validity. As a consequence, society would lack clear norms, resulting in heightened potential for confusion and conflict.

4.1.2. Lost personal identity

Using digitized personal identification systems could place a higher priority on numeric identification instead of name identification. And what happens to personal identity when the information stored in central databases is lost, stolen, destroyed, or altered?

Cutting-edge medical technology, such as xenotransplantation (also called nuclear transplants [14]), in which animal organs or genes are implanted into humans, could blur the lines between species: “Is it a human, animal, or chimera?” This practice will grow, especially in developed countries with stronger economies where people can afford heart, lung, and kidney transplants. Because the demand for human parts and organs will rise (at present, the supply of transplant organs meets only 40% of need), xenotransplants could become increasingly common (Table 3), especially for gravely ill patients [15].

If the ethical issues associated with xenotransplants and other biotechnologies are not clarified within the next few years, many people may suffer personal consequences from such practices, and the world might witness unforeseen social conflict.
Table 3
Forecast of global demands for transplants

<table>
<thead>
<tr>
<th>Transplants</th>
<th>1999</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kidney transplants</td>
<td>33,000</td>
<td>300,000</td>
</tr>
<tr>
<td>Heart transplants</td>
<td>3,000</td>
<td>110,000</td>
</tr>
<tr>
<td>Lung transplants</td>
<td>1,200</td>
<td>30,000</td>
</tr>
<tr>
<td>Combined heart–lung transplants</td>
<td>150</td>
<td>20,000</td>
</tr>
<tr>
<td>Value of organ sales</td>
<td>&gt; $1 billion</td>
<td>—</td>
</tr>
<tr>
<td>Needed animal donor breeding units</td>
<td>—</td>
<td>320</td>
</tr>
<tr>
<td>Annual revenues from pig organs</td>
<td>—</td>
<td>5 billion</td>
</tr>
</tbody>
</table>

Source: D. Hofmann [16].

4.1.3. Conflict over personal freedom

Science fiction writers describe societies in which crime is eradicated by the installation of complicated surveillance and tracking devices [14]. However, history has shown that when citizens lose their privacy and personal freedoms, governments and others often seek to control people’s freedom [17]. Thus, communication networks could become powerful bargaining tools in the future.

If technology develops at its current or even projected pace, it would eventually be possible to link all personal information into a single global database. Governments could then use this knowledge to control personal freedoms. In such a case, people might not be aware that their rights and freedoms had been violated.

Many governments have already implemented huge databases to store personal data. Conflict could arise when people disagree with government use of such databases. Society will need to seek a new balance in the tradeoffs between the benefits of globe-spanning information networks and the potential loss of personal privacy.

4.1.4. Conflict over information and dissemination

The installation of wide-bandwidth technology will bring access to many music, movie, and television channels. A mass media that is linked to the Internet would, theoretically, have no constraints. Yet, it is important that the government monitor the media, as it can powerfully direct public opinion. For this reason, conflicts between the government sector and the media will tend to become more serious in the future.

4.2. Social disparities

New and unforeseen disparities between the wealthy and the poor, with the potential for added conflict, may appear. Such increasing economic disparity could be caused by several technological factors, as follows.

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5 The European Parliament debated a controversial resolution that would provide the technical infrastructure to enable police agencies to eavesdrop on Internet, fax, and cell phone communications.
4.2.1. Disparities in access to information and IT

I believe new technologies could give the poor greater opportunities and more income. At the same time, technology could also expand the opportunities and income of the rich. The gap between the poor and the rich might become even wider as digital technology gives those with access to it more effective production and marketing systems, thereby resulting in higher personal productivity.

Digital technology may give people increased economic opportunities through more direct access to the global marketplace. Digital technology business could give small businesses, including one-man operations with a computer, an advantage. At present, small home-based businesses are multiplying in North America and Europe. As a result, the demand for skilled human resources in the IT field is increasing while demands for traditional jobs are decreasing.

Within developing regions such as Asia, decreasing numbers of conventional, labor-intensive jobs could mean the unskilled will remain unemployed. Social stratification may occur by a new means. The new upper class could be defined as those having access to information (the information elite). Those who cannot gain access to the information channels or those who cannot adjust to the changing demands of new technology will be isolated from information networks and associated economic opportunities. This second scenario will characterize developing countries.

For this reason, the income gap between the developed and developing nations will grow wider. About 93% of the world market for information technology is concentrated in OECD nations while the remaining 7% is in the developing world. Moreover, 75% of the world’s telephones are in North America, Western Europe, and Japan [18].

Growing economic disparity due to technology-induced causes is also occurring within nations. Data released from the US Department of Commerce reveals that the so-called “digital divide” — the gap between those with access to telephones, personal computers, and the Internet and those who do not have such access — is growing significantly [19]. The gap in computer ownership and Internet access has grown larger along education, income, and race divisions. Highly educated people, high-income households, children from Caucasian families, and children from two-parent families have greater opportunities to access information networks and Internet technology than those who have low education, low income, and those from black or single-parent families.

4.2.2. Disparities in access to biotechnology

Advances in biotechnology, especially those in the field of genetic research, will greatly boost yields, crop quality and will lower the need for chemical solutions in agricultural production. Farmers using biotechnology could have a greater comparative advantage than those who do not. Thus, farmers in developing countries lacking access to this technology will not be able to compete with those in the developed countries.

We will also see disparity in R&D efforts. Scientific and technological research in the medical, agriculture and technology fields is concentrated in the developed countries, especially in the handful of large transnational companies. Trade agree-
ments will enforce the protection of intellectual property causing developments in medical technology to remain in the hands of a few.

4.2.3. Disparities in access to employment

New digitization will not just deprive many workers of their jobs; it may leave them stranded in a cyber society. In some cases, information technology does not totally eliminate the need for humans but greatly reduces it. For example, translation software provides a rough translation, but it cannot provide a coherent text. In other cases, technology completely replaces the need for human agents. For example, digital technology has made getting an airline seat so simple that members of the public have begun doing it for themselves rather than using a travel agent. Possibly, fewer middle managers will be needed for supervision and reporting. Bank loan officers, insurance clerks and middle managers could be the most common victims of downsizing. The new economy will create more new jobs in the developed countries but it could help to inflate unemployment in developing countries as even moderate increases in technology could replace large numbers of low-educated and low-skilled laborers in these countries.

5. Conclusion

Globalization, along with digitization and biotechnologization, could produce catastrophic and beneficial effects in society over the next 20 years. The ability of governments, corporations, community groups, and individuals to handle such future trends will be contingent upon their ability to handle the changes that technology has already thrust into way at present. Success is not only determined by our ability to handle the present challenges, but even more so, to correctly foresee and to plan for future ones as well.

References


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