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Strategic Technology Institute

Revisiting Ethics in an Era of Global Technology Diffusion: The Case of the 'Digital Divide'

By

Blake L. White

The Strategic Technology Institute, 662 Trestle Glen Road, Oakland, CA 94610.
www.strategic-tech.org, 510-839-6447, blake@strategic-tech.org

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Abstract

The Director of the Technology Opportunities Program of the US Commerce Department's National Telecommunications and Information Administration, Anthony Wilhelm, states that, the great challenge of the 21st-century 'digital divide' is not a technological problem, but rather a social one, where the global society must come to terms with our diversity. This book uses engineering ethics to test the strength of Wilhelm's assertion.

While over the past twenty years the global digital divide of Information & Communications Technologies, also referred to as ICTs, among developed and developing nations has shown impressive movement toward closure, the ethical perspectives regarding the equitable distribution of ICT's benefits within or among countries has too often taken on the superficial argument of computers, communications lines, databases, and software programming. This masks its complexity. The digital divide is a struggle for distributive justice applied to life and death priorities, such as disease, poverty, and illiteracy, and access to the infrastructure for public goods, services, and wealth. This social evolution is occurring in a rapidly transforming information economy that is intertwined with historical issues of race and class. Therefore, the 'real' digital divide is not about the just distribution of computers; it is about the just distribution of opportunity for economic and social development in a technological society, and the moral application of new technologies. It is about human capital development, rather than technology acquisition and access.

If Wilhelm is correct, then John Stuart Mill's ethics of *Distributive Justice* and John Rawls' *Difference Principle* need to be re-examined and redefined in an era of technologically-enabled global restructuring of the social and economic order.

In the twenty-first century, the capacity to communicate
will almost certainly be a key human right.

-- Nelson Mandela, President of South Africa
World Telecommunications Forum, 1995

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Chapter One

The Ethics of Equitable Technology Diffusion

Man's power over nature
is really the power of some men over others
with nature as their instrument.

-- C. S. Lewis

When one uses traditional utilitarian ethics principles to examine the various disparities in the diffusion of computer-based abilities to search, retrieve, transact, and publish information via the Internet – what has been commonly referred to in political circles over the past decade or more as the 'digital divide' -- it highlights a definitional problem. The 'real' digital divide has less to do with the just distribution of computers than the just distribution of opportunity for economic and social development in a technological society, and the moral application of new technologies. Therefore, providing computer-based tools to those in need, though required to close certain information gaps between segments of society, are insufficient to adequately address the socio-economic development of underserved, undereducated, and underrepresented groups.

Over the recorded history of humanity's struggle for survival, the fate of society has often depended upon the possession and wise application of technologies[1] to engineer collective opportunity. Tremendous economic opportunity and societal realignment have both accompanied major technological advancements. The beneficial transitions from hunter-gatherers to settled agriculture to industrialization have come at the price of subjugation, exploitation, and dislocation. Likewise, under the aegis of global capitalism, the transition from a twentieth century industrial age into a twenty-first century information-based social order offers unparalleled economic, educational, and governmental advances at the risk of marginalizing those unable to access and leverage the advantages of Information and Communications Technologies, or ICTs. The ethical guidance provided by John Stuart Mill's *Distributive Justice*,[2] and John Rawls' *Difference Principle*[3] have proven themselves valuable to policymakers who have confronted the intended

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[1] Perhaps it is useful to define what one means by *technology*. It is derived from the Greek words, *techne* and *logos*. The former means art or craft, and the latter signifies discourse or organized words. Much of the relevancy of science to society arises by way of technology. There are close relationships between *science* and *technology*; yet science is not technology and technology is not science. Technology is how we do things, not how we think of them. To this extent, technology is not neutral. Technology is applied, but is not necessarily based upon science. In fact, as the astronomer Robert Fischer notes, "to define technology as applied science is to miss much of the significance of the relationship that exists between science and technology." He defines technology as the totality of the means employed by peoples to provide material objects for human sustenance and comfort (Fischer 76). Even though we do not normally think of technology as consisting of written or spoken words, as implied by logos, it does involve the systematic organization of processes, techniques, and goals. As José Ortega y Gasset sees it, "Without technique – the intellectual method operative in technical creation – there is no technology. But with technique alone there is none either." (154-155). Robert Hammond defines technology (engineering) as a means by which the knowledge of mathematical and rational sciences is applied with judgement to develop ways to utilize the materials and forces of nature for the benefit of mankind (Hammond 5). As a result of overt human goals and subjective human judgment, technology is never neutral because it is directed in specific instances toward specific material objects.

[2] Principles of distributive justice are normative principles designed to allocate goods in limited supply relative to demand. The principles are based on what goods are subject to distribution, the nature of the subjects of the distribution, and on what basis the goods should be distributed (Julian, Stanford Encyclopedia of Philosophy).

[3] The most widely discussed theory of distributive justice in the past three decades has been that proposed by John Rawls in *A Theory of Justice* (1971) and *Political Liberalism* (1993). Rawls proposes the following two principles of justice:

- Each person has an equal claim to a fully adequate scheme of equal basic rights and liberties, which scheme is compatible with the same scheme for all; and in this scheme the equal political liberties, and only those liberties, are to be guaranteed their fair value.

and unintended consequences of technological development since the Victorian era. However, as society forges technology according to its needs and desires, technology may indeed force one to reevaluate the meaning of *usefulness*[4] implied by utilitarianism, *equality*[5] inferred by distributive justice, and *diversity*[6] at the core of the difference principle. An analysis of the *digital divide* dilemma using these ethical principles is instructive as to both the 'real' digital divide problem, as well as to how archaic modern Western society's notions might be regarding what is *valuable*[7] and what is a *fair allocation of resources*.[8]

The German philosopher Martin Heidegger (1889-1976) told of the inevitability of the two sides of technology -- as technology the savior that comes with inherent risks.[9] He argued that the danger inherent in how humans use technology also embodies the potential for great progress. Quoting the poet Hölderlin, Heidegger noted that "Where the danger is, grows the saving power also."

> If the essence of technology, Enframing, is the extreme danger, and if there is truth in Hölderlin's words, then the rule of Enframing cannot exhaust itself solely in blocking all lighting-up of every revealing, all appearing of truth. Rather,

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- Social and economic inequalities are to satisfy two conditions: (a) They are to be attached to positions and offices open to all under conditions of fair equality of opportunity; and (b), they are to be to the greatest benefit of the least advantaged members of society. (Rawls, *Political Liberalism* 5-6).

The main moral motivation for the Difference Principle is similar to that for strict equality: equal respect for persons. Rawls is not opposed to the principle of strict equality per se; his concern is about the absolute position of the least advantaged group rather than their relative position. If a system of strict equality maximizes the absolute position of the least advantaged in society, then the Difference Principle advocates strict equality. If it is possible to raise the absolute position of the least advantaged further by having some inequalities of income and wealth, then the Difference Principle prescribes inequality up to that point where the absolute position of the least advantaged can no longer be raised (Julian, Stanford Encyclopedia of Philosophy).

[4] The basic theory of *Utilitarianism* is one of the simplest to state and understand. Utility has been defined variously as pleasure, happiness, or preference-satisfaction. So, the principle for distributing economic benefits for 'preference utilitarians' involves choosing that distribution maximizing the arithmetic sum of all satisfied preferences weighted for the intensity of those preferences (Julian, Stanford Encyclopedia of Philosophy).

[5] One of the simplest principles of distributive justice is that of strict or radical equality, which says that every person should have the same level of material goods and services. The principle is most commonly justified on the grounds that people are owed equal respect and that equality in material goods and services is the best way to give effect to this ideal. The strict equality principle implies that there should be the same bundle of material goods and services rather than the same level (so everyone would have 4 oranges, 6 apples, 1 bike, etc.) (Julian, Stanford Encyclopedia of Philosophy).

[6] Influenced by de Tocqueville's analysis of American culture, John Stuart Mill came to think that the chief danger of democracy is that of suppressing individual differences, and of allowing no genuine development of minority opinion and of minority forms of culture. Democracy might impoverish the culture of the community by imposing a single and inflexible set of mass values. This form of government has the virtue of fostering intelligence, common moral standards, and happiness; but where the citizens are unfit and passive it can be an instrument for tyranny (Wilson, Stanford Encyclopedia of Philosophy).

[7] The main problem with strict equality is that people have differing perspectives of what is valuable and what is not. For instance, a person preferring apples to oranges will be better off if she swaps some of the oranges from her bundle for some of the apples belonging to a person preferring oranges to apples. As a consequence, requiring identical bundles will make virtually everybody materially worse off than they would be under an alternative allocation. So specifying that everybody must have the same bundle of goods does not seem to be a satisfactory way of solving the equality problem, if different people value different things (Julian, Stanford Encyclopedia of Philosophy).

[8] Ronald Dworkin, (1981) proposes that a fair material distribution might be if everyone is given the same purchasing power and each use that purchasing power to bid, in a fair auction, for resources best suited to their life plans. Although people may end up with different economic benefits, none of them is given less consideration than another (Julian, Stanford Encyclopedia of Philosophy).

[9] Heidegger, widely regarded as one of the most original and influential twentieth century philosophers, was influenced by Catholic theology and Edmund Husserl's phenomenology. Phenomenologists tend to oppose the acceptance of unobservable matters, grand systems erected in speculative thinking, and *naturalism* (also called *objectivism* and *positivism*). They justify cognition with reference to what Husserl called *Evidenz*, and hold that inquiry ought to focus upon what might be called "encountering" as it is directed at objects and, correlatively, upon "objects as they are encountered" (Center for Advanced Research in Phenomenology).

> precisely the essence of technology must harbor in itself the growth of the saving power. In technology's essence roots and thrives the saving power (28-29).

Perhaps heeding Heidegger's cautiously optimistic approach to technology is in order. Heidegger was a proponent of technology, in its broadest sense, as a way for humans to fulfill our collective destiny. He understood that the danger inherent in how humans use technology also embodies the potential for great progress.[10] Likewise, José Ortega y Gasset (1883-1955) reminded us that when a society delegates its work to machines, the technology is no longer just an extension of human physical capabilities and man is not just a technician; this empowerment of technology makes humans free-willed engineers of our own collective "program" (Ortega 124, 148-149). Like Heidegger, Ortega acknowledged the risks that inherently accompany any new technology, but in order to achieve humanity's collective program, the risks must be managed. Ortega advises, "Human life and everything in it is a constant and absolute risk. The deadly blow may come from where it was least to be expected" (Ortega 103). Since technology amplifies humans' ability to act upon work or, in the case of ICTs, one's ability to make decisions and act upon them, it is prudent that wise use of technology becomes paramount.

The pervasiveness of ICT in modern developed societies has been accompanied by growing concerns voiced by educators, politicians, public advocacy groups, and professional engineering societies about the stark disparities between the information rich and the information poor. In the United States, this concern can be traced back to the early 1980s, when there were warnings by African-American professional engineering societies[11] and highly visible social activists. It became a mainstream issue in the late 1980s and early 1990s, as it was highlighted in the presidential campaign of Governor Bill Clinton and Senator Albert Gore. The subsequent growth of the computer industry and the embracing of ICT by suburban families and wealthier school districts brought even more attention to the inequalities of Internet access by poor inner city and rural populations. [12] This problem was euphemistically called the *digital divide*. The National Association for the Advancement of Colored People (NAACP) defined it this way, "Technology is altering the way Americans order the world and has the potential to perpetuate disparities, class advantage, and racial caste. The 'digital divide' describes the technology gap that falls along the lines of race and class."

In the 1980s and 1990s, high-tech entrepreneurs were getting incredibly wealthy developing and exploiting ICT. It seemed that the entire US financial services sector, government information sources, public libraries, colleges, consumer durable and non-durable retailers, and the entertainment industry were all rushing to embrace the Internet. However, there remained valid concerns about major sectors of society being left behind. Even with the support of President Clinton, some estimates were that only 11 percent of US households had a personal computer with a modem in 1994.[13] According to a 2002 assessment by the NAACP:

> The digital divide is deep and wide. Only 64% of classrooms in schools with a 50% or higher minority enrollment are connected to the Internet. Moreover,

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[10] Heidegger was concerned that our perspective that technology is for purely utilitarian purposes, and that this view might blind one to the insight of the greater good of technology. Heidegger referred to the undifferentiated supply or 'standing-reserve' of the available matter that is objectified by man via technology as a 'means to an end.' He also saw the extreme focus on technology's ends as being short-sighted, "…the only important quality has become their readiness for use…their only meaning lies in their being available to serve some end that will itself also be directed toward getting everything under control" (Heidegger 32-35).

[11] Example organizations include the National Society of Black Engineers (NSBE), the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers (NOBCChE), and the National Technical Association (NTA).

[12] The growth of the US ICT industry might also be attributed to Clinton and Gore's advocacy of the Internet in the 1990s -- which they called the 'Information Superhighway' -- combined with the massive transition of government scientists and engineers from defense into private sector consumer-oriented technology companies, Y2K preparations, falling prices and broad-scale adoption of personal computers, and a frenzy of venture capital investment in the historic prelude to the dot-com bubble.

[13] Benton Foundation. *Telecommunications and Democracy,* 1994.

> teachers in majority-minority schools were more likely to cite the following as barriers to the use of computers for instruction time: not enough computers (45%), outdated, incompatible or unreliable computers (32%), and Internet access not being readily available (36%).

By 2003, the Commerce Department reported that high-speed Internet access had doubled since 2001 to 20 percent of US households, but that 24.7 percent of rural households, in comparison with 40.4 percent of urban households, had broadband or other high-speed connections. The study also found that minority US residents had even lower adoption rates, with 14 percent of black and 13 percent of Latino households having broadband.

As with most debates over the distribution of public goods and services, the disparities of the ‘haves’ and ‘have nots’ and the associated rights that are being either granted our violated become a matter of ethics. To this debate, engineering as a profession and engineers as world citizens can play important roles in ensuring that technology is applied according to the ethical principles of John Stuart Mill (1806-1873) for the maximization of benefits for the broadest number of people (McGinn, *Ethical Issues* 12). Anthony Wilhelm, of the US Commerce Department’s National Telecommunications and Information Administration, observes, “For Mill, the challenge was not so much the mastery of nature, but rather the fair distribution and civilized use of the fruits of our mastery.” Mill was convinced that people were capable of living commodiously under the right circumstances of solidarity, democracy, and equality. Alternatively, he believed that social unrest resulted from the injustice of people not being able to realize the social basis for self-respect and solidarity due to stark inequalities (Wilhelm 127).

When one considers the digital divide in the context of Mill’s principles, one recognizes that, in a technologically-intensive society, there may be a profound unfairness when it comes to *access* to economic development opportunity. Without Internet access and basic computer skills, one’s whole life in twenty-first century America costs more. Job openings are placed on Internet-based job boards and responses are expected via electronic applications or emailed resumes. Interview candidate selections are being made by computer-based filtering systems. Electronic banking has moved from a convenience to the standard way consumer banking is done. The next step is online voting, where what was meant to be a convenience and a means to reach more voters could place at risk the participatory democracy of those without access to computers and the Internet. With such a profound change in the daily lives of Americans, it is no wonder that the digital divide is a crucial matter of public policy.

In 2005, however, the public policy discussion about the digital divide has taken on a global scale. “We want to reap the benefits of the Internet and join the rest of the world. That is when we can truly be an information society, otherwise the digital divide will widen," Sam Nkusi, Rwandan Minister for Energy and Telecommunications, told the BBC (Hermida). As UN Secretary General Kofi Annan assesses it, “In a world where the ability to communicate, educate, and participate in government are as fundamental as food and medical care, we dare not address the global and domestic digital divide – a gulf of economic development opportunity.” Therefore, the United Nations is considering a *Digital Solidarity Fund* to finance projects to address the uneven distribution and use of new information and communications technologies (The Economist 22).

With ethical dilemmas come the claimed rights of competing stakeholders. The stakeholders in the digital divide debate seem to be arguing about the issue of *equitable access* to ICT. Over the past two decades, at least three schools of thought have evolved and, Therefore, three ways to look at equitable access. To what extent can utilitarian consequentialist ethics help one to better understand the parameters of the digital divide and sort out the validity of competing stakeholder arguments? *Consequentialism* looks at the morality of actions based on a balance of good and bad consequences. It tries to maximize the balance of positive value over disvalue, or the least possible disvalue, if only undesirable results can be achieved. For example, an ‘Act Utilitarian’ looks at practices that, over time, maximize the overall welfare of society. So, Utilitarians consider the positive and negative consequences of injecting ICT technology into underserved communities, globally, as well as domestically.

If the digital divide is fundamentally an issue of equitable access, consequentalist utilitarian ethics should aid in one’s understanding of the problem. If access to ICT is denied to major sectors of the population, what is the consequence to the collective and to the individual? If access is not denied, but provided only as a function of normal technology diffusion found with other consumer products, what would the likely result be? If access to ICT is not denied, but made available as a part of a progressive government plan to assist in closing the access gap, rather than leaving it to raw market forces, what are the likely benefits and disadvantages? Finally, if universal access to ICT were granted to the entire population, would that solve the digital divide problem? If none of these solves the digital divide problem, might that imply that the popular use of the term digital divide is ill defined or perhaps might it lead one to reevaluate the underlying assumptions of what distributive justice means in high-tech society?

If access to ICT is denied to major sectors of poor populations, is it relevant to the collective and to the individual? An odd mixture of stakeholders, including non-governmental organizations (NGOs), such as the Gates Foundation, and the controversial President of Zimbabwe, Robert Mugabe, believe that even if there is a digital divide, it is irrelevant in the lives of poor people. The limited resources of the poor and their donors should go to meeting basic human needs, such as health, food, potable water, and basic literacy. Therefore, they believe that it is unethical to spend scarce resources on ICT.

As an example of the political divide associated with this issue, consider how Zimbabwe's Robert Mugabe, broke ranks with Senegal's President Abdoulaye Wade and other pro-technology presidents of Mali and Mozambique at a 2003 United Nations conference on Internet technology in Geneva. Mugabe said that there could be no just information society without more social equality. As reported by the BBC, Mugabe said there was no point in providing poor people with computers unless they were also given electricity and a phone network to run them. He then attacked the general world order, saying that digital technology was being used by some to dominate the globe (Doyle).

The issue of a digital divide within the US or among developed versus developing countries has too often taken on the superficial argument of computers, communications lines, databases, and software programming. Such focus on the equipment and access to information may not go far enough to address the underlying problems – those of life or death priorities. The fundamental right to life, human dignity, and personal freedom requires food, safe water, shelter, a basic level of education, and at least a minimum acceptable standard of healthcare. As with other goods and services that are subject to resource constraints, preventive healthcare and clinical intervention are not available to hundreds of millions of people, most in developing countries in Africa, Asia, and South America. These regions represent the bulk of humanity, yet their medical needs are underserved, and some local governments, computer industry moguls, and well-meaning non-governmental organizations (NGOs) are trading the survival basics for exotic ICT projects of dubious value. When one applies utilitarian consequentialist ethics to the problem, it becomes clear that computerization of the developing world might represent a misallocation of funds, if *relevant distributive justice* is the goal.

We live in a society that rapidly diffuses technology to an increasing number of rights claimants, each of whom exercises maximalist uses of technology. Therefore, even those who can afford to pay for computers and Internet access in developing countries, may not have an unbounded *positive right* to do so if expensive ICT infrastructure prevents their fellow citizens from experiencing the most basic preventive care, clean water, sanitation, minimal nutritional requirements, prenatal care, inoculations, and relief from easily treated medical ailments, such as pain, dehydration, diarrhea, influenza, and the childhood diseases. This ultimately leads to the destruction of the commons and degrades the overall social fabric. Therefore, the rights of stakeholders must, at a minimum be bounded by the constraints of the modern technological society and, in certain special cases, be restricted.

McGinn argues that:

> An acceptable theory of rights in contemporary technological society must be able to take on board the implications of their exercise in a context in which a rapidly changing, potent technological arsenal is diffused throughout a populous, materialistic, democratic society. Use of such a technological arsenal by a large and growing number of rights holders has considerable potential for diluting or diminishing societal quality of life. Indeed, insistence on untrammelled, entitled use of potent or pervasive 'technics' by a large number of individuals can be self-defeating, e.g., by yielding a state of social affairs

incompatible with other social goals whose realization the group also highly values (McGinn, *Technology* 14-15).

In cases where the aggregate unbounded rights of a pre-technical era are extended to individuals and their actions harm society, McGinn builds a convincing case for restricting those rights (McGinn, *Technology* 14-15). Among the conditions for restriction are:

- If the very existence of society is called into question
- If continued social functioning is threatened
- If some natural resource vital to society is threatened
- If a seriously debilitating financial cost is imposed on society
- If some significant aesthetic, cultural, historical, or spiritual value to a people is jeopardized, or
- If some highly valued social amenity would be seriously damaged.

As the ICT skeptics see it, the time has come to reconsider the unbounded and maximalist uses of ICT technology and expertise for what might be considered nonessential, vain luxuries, such as games, idle chatting, and music swapping, when basic education, communications, employment, and democracy seem like better uses of scarce ICT. According to McGinn's criteria, such uses:

- Detract resources from the well-being a global society dominated by the poor,
- Further attracts the best expertise away from non-profitable, non-glamorous, and non-cutting edge careers that are no less needed by the bulk of humanity,
- Engenders a massive financial cost that is subsidized by the poor, public research, and tax breaks,
- Devalues the worth of communications and education to what is purely financial, and most importantly,
- Allows the very real threat of massive inequality to fester, which could affect security.

Alternatively, if access is not denied, but provided in a laissez faire manner as a function of normal technology diffusion, what might the likely result be? This is the position of free market proponents, such as the Cato Institute, OECD, and the Bush Administration who do not believe that there is a digital divide at all. They point to the historical diffusion of new technologies as a predictable pattern where the rich always lead in adoption. They argue that as the costs of the technology come down and as technology is found in public places, even the poorest of citizens will have access to ICT over time, as we are seeing in Brazil, South Africa, and Mexico. So, to this group, the divide is closing and it would be unethical to favor one group over other groups.

Consider as well the perspective of the ICT activists. If access to ICT is not denied, but made available as a part of a progressive government plan to assist in closing the access gap, rather than leaving it to raw market forces, what are the likely benefits and disadvantages? Progressive globalists, such as UN Secretary General Kofi Annan, President Bill Clinton, Prime Minister Tony Blair, and the governments of developing countries such as Senegal, Rwanda, Mali, plus those domestic civil rights groups, including the NAACP, and the Urban League, see the disparity of access to information and communications technologies along racial and class lines as a modern human rights struggle. One in which equality of education, economic opportunity, and governance is threatened. They believe it is unethical to provide rights to the rich that are not available to the poor and that government has a role to assist where markets alone are insufficient or disinterested.

Finally, if universal access to ICT were granted to the entire population, would it solve the digital divide problem? A study by researchers from Pennsylvania State and Georgia State University in 2002 found that when the city of LaGrange, Georgia made access to the Internet free to every household, it failed. They found that the lack of adoption of the technology had much more to do with its irrelevance to the lives of the citizens, a distrust of the government, and illiteracy (Keil 8-9). So, according to the LaGrange findings, ICT access alone may not be the source of the digital divide problem.

If both giving and withholding ICT access inadequately addresses the digital divide problem, might that imply that the popular use of the term *digital divide* is ill-defined or perhaps might it lead one to reevaluate the underlying assumptions of what distributive justice means in high-tech society? Many of today's ethical controversies can be traced back to an archaic set of assumptions regarding the rights of stakeholders. These rights often were developed at a time when the economic, social, and environmental conditions made their individual applications less of a problem than today. The Universal Declaration of Human Rights asserts individuals have the right to seek, receive, and impart information and ideas through any media, regardless of frontiers, as a function of one's freedom of expression (Wilhelm 61). In the US, social justice advocates who seek to close the digital divide have been reinterpreting seminal civil rights laws and milestones cases to address digital inequities. For fair access to jobs and services, the Civil Rights Act is referenced. Brown v. Board of Education helps shape educational access arguments. The Voting Rights Act is being used to prevent digital disenfranchisement (Wilhelm 61). But, do rights provided in the non-digital world automatically transfer to the same rights in the digital realm?

It should come as no surprise that the digital divide has been framed as an issue of access to technology. ICT infrastructure is tangible. People can count the number of computers, network connections, and web page 'hits.' Since this technology came to us from the computer industry, it likewise should be no surprise that the value system of the ICT industry, typically represented by the ethos of Silicon Valley, has taken on the tangible success criteria of computer scientists and engineers.[14] According to San Jose State anthropologist, Jan English-Lueck:

> The notion that a culture can be identified with its economic specialization – and the technology associated with it – is a very old and widespread idea. Of course, the worldviews held by individuals or by groups are very influential in determining behavior, as well as in determining motivations, attitudes and actions. Working with technology, thinking about technology, and producing technology change the way Silicon Valley people construct reality by giving them new metaphors (66).

In Silicon Valley, people transfer engineering and entrepreneurial approaches to their understanding of the social world, such that efficiency, utility, instrumentality, and economic rationality become the philosophical underpinnings of their worldview[15] (English-Lueck 74-77). She notes that, "In Silicon Valley, people view the daily conflicts of life as 'social engineering problems' that can be 'solved' if given thoughtful and systematic appraisal" (English-Lueck 76).

Therefore, it is not surprising that the digital divide argument has often focused on the lack of computers in homes or schools, but the problem may be far more complex than that. In the US, the digital divide debate is a surrogate for the degree of fairness, or the lack thereof, associated with the infrastructure for the systemic distribution of goods, services, and wealth in a rapidly transforming information economy – one that requires a certain level of technical sophistication for one to be an active and successful participant. Issues of distributive justice become intertwined with issues of race and class. As Wilhelm states it, "The great challenge on the horizon in the 21st Century is a social, not a technological, one, that is to say, coming to terms with our diversity in a Digital Nation" (125). Therefore, access to technology is a far too simplistic representation of what may actually be occurring in the global society.

The complexity is further shown by John Rawls' contention that a just society is not one where everyone is equal, but one in which inequalities must be demonstrated to be legitimate. Most importantly, in a Rawlsian society, everyone must be given a genuine opportunity to acquire membership in a group that enjoys special benefits (Munson 22-23). So, the moral argument should not be restricted only to the distribution of computers, but it needs to be expanded to

[14] The high-tech industrial base in Silicon Valley is based on such industries as aerospace, defense, semiconductors, computers, software development, telecommunications, and biotechnology (English-Lueck 82).

[15] English-Lueck draws an analogy to other cultures and worldviews. Devout Christian fundamentalists frame the happenings of the world as functions of 'good' and 'evil,' and during China's Cultural Revolution, every action was viewed as a political event – even choosing a bride from the proletariat (74-77).

address the distribution of *relevant benefits*. Therefore, the moral question that needs to be addressed is to what extent should market forces be allowed to create an unfair distribution of benefits when the digital divide is not just a case of technology diffusion, but a profound change in the social and economic foundation for global society, and Therefore, each person has a right to basic communications and educational infrastructure?

Relevant distributive justice, combined with utilitarian ethics might help decision-makers understand that the digital divide is not just about the equitable distribution of computers; it is about human capital formation and the just distribution of opportunity. As a matter of social justice, public policymakers have an obligation to ensure basic economic development opportunities, education relevant to global society, and inclusive governance to all, regardless of income. They must provide for equitable distribution of the real costs and benefits of ICT. As a matter of fairness, policymakers must also ensure that if anyone is to be negatively affected by the unequal distribution of technology, at least a proportional share of the benefits will accrue to the most negatively affected groups. In a connected world of the global economy, where alienation, dislocation, and extreme inequity threaten all of humanity, its is morally wrong and short-sighted to address these issues in any other manner than via a global strategy.

Where the 'real digital divide' has had a successful track record toward closure, for instance in India, China, Korea, Estonia, and Finland, it seems to have been where the issue was not perceived as access to ICT per se, but access to social and economic opportunity to make productive use of the technology. "The choice should not be between Pentiums or penicillin," argued Sam Nkusi, the Rwandan Minister for Energy and Telecommunications at the 2003 UN-sponsored World Summit on the Information Society (Simmons).

This project seeks to examine the strengths and limitations of utilitarian ethics when applied to illustrative digital divide public policy concerns within the US and among several developing countries. It seeks to test Wilhelm's contention that the digital divide issue is more social than technological.[16]

This book argues for a more just distribution of relevant public benefits from the application of updated ethics by the ICT industry led by an enlightened engineering profession. This 'Talented Tenth' needs to apply twenty-first century versions of Mill's *relevant distributive justice* and Rawls' *protection of the most vulnerable* in its technology development and business decisions. Otherwise, raw commercial interests of the ICT industry threaten to overshadow the overall public good. We seek to *justify* information technology, not in the popular use of the term, which alludes to making excuses; rather, we seek to make the actions of computer scientists and engineers just, i.e., honorable and fair. We demand *facere* (to make) *justus* (lawful, right, or fair).

We examine whether a framework based on a revised definition of utilitarian ethics and relevant distributive justice offers a fairer approach to ICT that is appropriate to the realities of the twenty-first century global society.

[16] When one looks at the global digital divide from the African-American community's perspective, there may also be lessons from Indian and Asian public policy decisions regarding the successful investment and diffusion of ICT that bear a striking similarities to the resolution of a 100-year old debate between the WEB Dubois and Booker T. Washington schools regarding how best to train those disadvantaged by race and class in a rapidly industrializing society. Zero-sum thinking that the digital divide can be resolved by either Dubois' academically-trained and ethical Talented Tenth or Washington's vocationally-trained craftsmen has been disproved in India and China. If Wilhelm is correct, human capital development will require a blend of both DuBois' and Washington's social philosophies, updated for the global technologically-based economic realities of today.

Chapter Two

Irrelevance of the Digital Divide

Are you unaware that vast numbers of your fellow men suffer or perish from need of the things that you have to excess, and that you required the explicit and unanimous consent of the whole human race for you to appropriate from the common subsistence anything besides that required for your own?

-- Jean-Jacques Rousseau, 1755

If access to Information & Communications Technology is denied to major sectors of the population, what is the consequence to the collective and to the individual? *Distributive justice* concerns the distribution of social benefits and burdens, and seeks to ensure that people receive that to which they are entitled.

In 2000, Yoshio Utsumi, the Secretary General of the International Telecommunications Union (ITU), noted that:

> "One of the objectives of the ITU, which was founded some 135 years ago, is to extend the benefits of telecommunications technologies to all the world's inhabitants. However, it remains the case that the majority of the world's citizens have never made a telephone call, let alone sent an email, and the telephone network is not even within walking distance for large parts of the world. Low income countries account for more than one third of the world's population, but they share just only 4 percent of the world's telephone lines, fewer than 0.7 percent of mobile phones and less than a tenth of one percent of Internet host computers. A wider distribution of fixed telephone lines and mobile connections is an essential prerequisite for bridging the digital divide" (Utsumi 1).

Will large-scale ICT investment in poor countries help societies or are they misguided panaceas? ICT can have considerable leverage to promote development and reduce poverty, but there are many complications. One finds not one digital divide but several – urban/rural, young/old, rich/poor, salaried/wage-earner, and male/female, for example. Also, the basic infrastructure for ICT is not in place. A very noticeable barrier is that created by high phone, connectivity and bandwidth costs in the countries most at the margins of telephone and Internet usage. Access problems can include electricity, infrastructure, computers and other devices, skilled users, and content. Moreover, according to the United Nations, ICT does not stand alone. The impact for human resources development comes from integration into other efforts, with adequate financing and skills from various quarters (UN 1).

Senegalese President, Abdoulaye Wade, at a 2003 UN summit said that African countries needed a 'Digital Solidarity Fund' to benefit from the digital revolution. He told the BBC that he was ready to turn not only to governments but private companies, individuals and city authorities in the West for investment. "We launched the idea of digital solidarity because we can't buy this equipment, we can't afford it" (BBC Online, 10 December 2003).

In an ethical context, distributive justice also concerns the distribution of social benefits and burdens based on *relevant* respects or *substantive* principles of *fairness* (Munson 37-38). In the context of the lives of the poor, an argument can be made that the digital divide, and its implied access to computer-based information, is irrelevant to the substantive life and death issues of the vast majority of the poor.

Warnings were issued back in 2000 at the G-8 Summit regarding the real nature of the digital divide. Even though the G-8's Digital Opportunity Taskforce, called Dot Force, and its Executive Secretary Bruno Lanvin promoted the need for inclusion of the developing world in the planning stages, Dot Force was not without criticism. According to Cheryl Brown of the University of North Carolina at Charlotte, "Prior to the establishment of the Dot Force, CSO Jubilee 2000 burned a laptop in protest at the Okinawa Summit. Press reports criticized the focus on the digital divide at the expense of other pressing issues of debt, poverty, infectious diseases, and illiteracy. Some skeptics questioned the existence of a digital divide; they viewed it as an extension of the longstanding North-South divide and assessed any collaborative initiative as a move to benefit a collective, global elite" (Brown 5).

Ismail Serageldin, the Director of the Library of Alexandria in Egypt, notes the stark differences between the 'haves' and 'have-nots.' The differences between the top 20 percent of the world's population and the bottom 20 percent are extreme and the gulf seems to be getting wider over time.[17] The richest 15 persons have more wealth than the combined GDP of all of sub-Saharan Africa's 550 million people (Serageldin 55-56). According to Serageldin, over 1 billion people do not have access to clean water, 2 billion have no access to adequate sanitation, 1.3 billion people in cities breathe air below the standards set by the World Health Organization, and 40,000 persons die from hunger-related reasons daily. When one considers exporting America's expensive technological wonders to the developing world, one has to recognize that 1.2 billion people live on less than one US dollar per day (Serageldin 54-58). This is the bleak reality of the global market that information technology seeks to exploit. Perhaps this is why the Copenhagen Consensus Project, a group of economists brought together to prioritize how donated development resources should be spent, identified seventeen priorities, but ICT did not make the list (The Economist 22).

Even for private funders, critics of their pilot ICT projects abound. Consider the digital divide policy dilemma of Eduvision's E-Slate pilot program in Kenya. In an attempt to address the lack of availability and the cost of textbooks for Kenyan families, Eduvision used personal digital assistants, also known as PDAs and referred to as *e-slates* in this case, to replace traditional textbooks. E-slates are wireless handheld devices enabled with license-free open source software that provide students in the small rural community of Mbita Point on the eastern shore of Lake Victoria with textual and visual information, audio files, video clips, and practice questions.

The content stored on e-slates could include anything from new textbooks to other content like local information or even reference pages from the web and they can be wirelessly updated. "At the moment the e-slates only contain digitized textbooks, but we're hoping that in the future the students will be able to complete their assignments on these books and send them to the teacher, and the teacher will be able to grade them and send them back to the student," cites Eduvision co-founder Maciej Sudra (Taylor).

Eduvision's co-founder, Matthew Herren, says families pay upwards of $100 a year for textbooks and that "Our system is something that we hope will be sustainable, and the money that they use towards textbooks could be used to buy e-slates instead, which can last more than a year, thereby reducing the cost of education." In the pilot, e-slates have replaced books for 54 pupils (Taylor).

Responding to Eduvision's pilot project, Kilemi Mwiria, Kenya's Assistant Minister of Education, Science and Technology believes the project is flawed not just in design, but in its very conception.

> "We need to be careful that we don't bring about too many experiments, and this is another such experiment being done without ensuring that we have the right environment for it to be assured of success. I think it's a big leap, a big giant leap for schools, students and communities that don't even know what a desktop computer is, as well as what you can use computers for. I think to suddenly bring even more advanced technology is being a bit unrealistic" (Taylor)

In like manner, Bill Gates, the billionaire founder of Microsoft, criticizes rural deployments of ICT in poor countries as "distractions from the real problems?" On a global scale, 1997 UN statistics estimated the spread of HIV to have reached over 306 million, two-thirds of whom lived in the countries of sub-Saharan Africa, who cannot afford the expensive combinations of drugs

[17] For example, the top 20 percent consumes 85 percent of the world's income, while the bottom 20 percent lives on 1.3 percent of the world's income. A generation ago, the top 20 percent were 30 times as rich as the bottom 20 percent. Today, they are more than 70 times as rich. The richest three persons on earth have more wealth than the combined GDP of the 47 poorest countries (Serageldin 55-56).

and treatments available in the US The UN estimates that 1,600 children a day are infected with HIV and 1,200 children die of AIDS daily (Munson 343). Recent reports from the United Nations indicate that in 2003 over 46 million people had AIDS, over 5 million were newly infected, and over 3 million died in 2003.[18] There is also suspicion that research funds are flowing to the diseases of the rich, where the highest profits may be garnered. "It is inconceivable that of the 1,233 drugs that have been approved in the last decade, only 11 were for treating tropical diseases [the region where most of humanity lives], and of these, half were intended for livestock, not humans," notes Serageldin. He goes on to observe that, "It is inconceivable that many of the persistent issues of child nutrition that could be tackled by changing the nutritional content of crops are receiving so little attention" (Serageldin 58). Likewise, Farmer reminds us that even limited use of antiretrovirals could have an immediate and substantial impact on South Africa's AIDS epidemic (Farmer xxvi). Therefore, with these stark facts before us, the Bill and Melinda Gates Foundation concentrates on improving health, instead of exotic ICT projects (Economist 22).

However, even if a country has a high level of access to ICT, it may conceal considerable inequity within the population, adding the wealth factor to the digital divide debate. Edwyn James of the Centre for Educational Research and Innovation (CERI) cites the following example, "The recent [2001] dramatic increase in Internet access within the UK in a single year highlights the growing disparity between the richest and the poorest sectors of society. Access for the nation's poorest 10% more than doubled during the year, but was still barely 5%, while at the upper end of the scale access was close to 50%" (James). Other disadvantaged groups in advanced countries, such as ethnic minorities, those who live in isolated communities, those who are socially excluded, and those with language barriers can be negatively impacted by the digital divide. James reminds us that, "Women in many societies are much less likely than men to have access to ICT. And there may be inter-generational gaps, such as for men in mid-life whose work skills are no longer in demand, whose modest educational achievements have left them ill-equipped even to want to become computer literate" (James).

When considering the digital divide in America, it is instructive to do so in the context of overall economic opportunity available across race and class lines. The parity, or lack thereof, between whites and African-Americans serves as a good example. The National Urban League's 2005 report, The State of Black America: Prescriptions for Change, examines the equality gaps and provides evidence that African-American economic progress is stagnant, and in some areas, declining. According to the Urban League, "In 2005, America commemorates the 40th anniversary of the passage of the Voting Rights Act of 1965 as the height of the civil rights movement, and yet, this year's State of Black America report's *Equality Index* reveals that despite societal gains, the overall status of blacks is just 73 percent of their white counterparts, marginally unchanged from the 2004 report."

The biggest divide between blacks and whites is economic status, nearly 20 percent worse than any other category in the Urban League's report. Although slight improvements are noted, the equality gap is getting worse in unemployment, building wealth and savings, reversing many of the employment and income gains made in the 1990's.

> Significantly, the economic status for African-Americans of 57 percent compared to their white counterparts. The median net worth for Blacks is ten times less than it is for whites at $6,100 vs. $67,000 respectively. Equity in the home for Blacks is nearly 50 percent less than whites at $35,000 compared to $64,200. There are nearly 3 times as many white businesses as black. In 2005, black unemployment remained stagnant at 10.8 percent while white unemployment decreased to 4.7 percent making black unemployment more than 2.3 times more than whites. The 2005 indices reveal the Black unemployment rate (10.8 percent) increased to 2.3 times compared to white unemployment rate at 4.7 percent widening the disparity between the races. In order to close the employment gap, there would have to be 947,000 more blacks employed. This indicates a worsening of the employment picture compared to 2004 index

[18] Reported on *The News Hour with Jim Lehrer*, PBS, 25 November 2003.

numbers which showed Black its would only take 751,000 jobs to close the gap. Black male earnings are 70 percent of white males AND would have to increase by $16,876 to equal income levels of white men. Black females earn 83 percent of their white counterparts, approximately $6,370 less. The poverty rate between Blacks and whites changed from 2004 as poverty rates for whites increased. In 2004, Blacks were 3X more likely to fall below the poverty line compared to 2005 where Blacks are twice as likely to fall below poverty line compared their white counterparts (National Urban League 4-5).

The National Urban League recommends specific policies and actions the nation collectively should take to stop the reversal of African-American progress. They include raising the minimum wage from the ‘poverty wage’ of $5.15 to a ‘living wage’ of $7.25 an per hour, closing the home ownership gap by making mortgages more available and affordable to all, and strengthening the Community Reinvestment Act. Catalyzing business development and entrepreneurship in the African-American and other urban communities might be accomplished by doubling the size of the New Markets Tax Credit Program, strengthening and improving the Community Block Development Grant program, and other urban economic opportunity and job training programs. The Urban League also urged the government and business leaders to develop a comprehensive re-entry program for ex-felons in need so that they can become working, able citizens and contribute to society. Importantly, as we enter a technologically-intensive global economy, there is a critical need to expand job training and career counseling efforts with a focus on young urban males (National Urban League 2-3). Notably, the brief reference to technology in the Urban League’s recommendations indicates its peripheral role in their prescription.

Likewise, when one examines the global digital divide argument, it is doubtful that computers alone will solve the fundamental, seemingly intractable, ‘poverty trap,’ as UN Special Advisory and Columbia University’s Jeffrey Sachs calls it (Sachs, *Strategic Significance* 3-4).

Chapter Three

Disappearing Digital Divide

A rising tide lifts all boats.
-- John F. Kennedy

If Information & Communications Technology access is provided only as a function of normal technology diffusion found with other consumer products, what might the likely result be? If one looks only at Nielsen/NetRatings' percentages, rather than absolute numbers or relative comparisons, the total global Internet usage grew by 125 percent, including 186 percent in Africa, 209 percent in Latin America, 124 percent in Europe, and 105 percent in North America (Friedman, World 198). As a matter of technology diffusion, the digital divide is slowly closing. Therefore, John Stuart Mill's distributive justice involving the maximal dispersion of the benefits of technology has a good chance of occurring over time.

According to a 2005 report by the Organisation for Economic Co-Operation and Development, high-speed, international infrastructure is becoming more accessible in developing economies. For example, there is a new undersea fiber cable extending from Spain and Portugal, down the west coast of Africa, around the Cape and over to the west coast of India. Coastal countries in Africa can tap into the fiber, while landlocked countries can establish connections via coastal countries. The OECD also reports that international Internet connectivity via satellite and terrestrial wireless services is also falling in price, which could bode well for Africa (OECD *Regulatory Reform* 7).

Even in a country devastated by the genocide of one million people, the digital divide is being closed. The small and densely populated Rwanda lends itself to the laying of fiber optic cables that would be too expensive to cover the vast tracts of land between the cites of most African nations. Government agencies, schools, businesses, Internet cafes, and individuals who are connected can benefit from data transfer speeds of up to two million bits per second (2 Mbps), offering phone, Internet, and television services. The capital, Kigali, has been connected to the next main town, Gitarama. Base stations along the way will allow wireless connections to the cable from several kilometers away. The plan is to link up all the five main population centers by the end of this year, reaching more than half the population (Simmons).

Developing countries are taking advantage of the commoditization of ICT, recyling, and the Open Source movement to address the costs associated with closing the digital divide. The Brazilian government decided to recycle used personal computers. Since only 12 percent of Brazilians own PCs, rather than spending money on new equipment, the Committee for Democracy in Information Technology (CDI) collects discarded and obsolete PCs from businesses and ships them to more than 900 schools (Technology Review 44). In addition, for at least three years, the Brazilian government has maximized its limited ICT resources by using the free operating system GNU/Linux. "The government is the biggest software buyer," said Beatriz Tibirica, who heads the E-Government initiative, in a 2003 BBC interview. "We can save a lot of public money using the free software solution." She pointed out that the free software has many advantages, including no need to pay for licenses. It is also possible to use a simpler version of the computers, with one server and several low-priced 'clients' - computers without hard disks that costs a quarter of the price of a machine and have reduced maintenance costs (Bacoccina).

The South African government's decision to use Open Source is a creative solution in the best interest of the country. It not only saves money, but allows for investment in the economic development of the country. South Africa has found that it is better to use Open Source software, which allows the country to spend 80 percent of its six billion rand annual software budget, equal to one billion dollars, on the growth and development of its indigenous software development industry, rather than ship those funds off to foreign companies (Technology Review 50).

In Guatemala, ICT helped overcome the failure of traditional business development services for microbusinesses. Workstations at 10 MicroNet centers enabled low-income entrepreneurs to innovate and reach beyond their own low-income communities to connect to higher income national and international markets. For many, this yielded a larger and more affluent client base, greater sales, higher net income, and new employees (World Bank 5).

ICT also allows government agencies, academic institutions, and medical researchers to share best practices. For example, in 2001, ten countries in the Americas participated in the Global Development Learning Network (GDLN), an innovative program that used ICT to allow sharing of experiences between decision-makers in the public and private sectors. Launched in June 2000, the GDLN, a network of distance learning centers, used video and Internet-based distance learning to discuss such topics as decentralization of health services, AIDS, and ethics in the public service. Events could be hosted from any site and, by linking with existing domestic distance learning networks, it has the potential to include thousands of participants (World Bank 3).

Computers found their way into private and public schools in the US over the past two decades and they have been used to enhance and strengthen the curriculum in basics, such as language, science and math, and they have also become a key component in allowing teachers and schools to accommodate individual learning styles, enhance students' interactions with each other, build self-confidence, and improve motivation. According to the Office of Technology Assessment (OTA) in 1988, in schools where computers were integrated into the classroom to help deliver the curriculum, students showed substantial improvement in math, reading and writing. They also exhibited higher-order thinking skills, were better behaved, and showed much more motivation to learn. The OTA concluded that the computer could be used as a tool to help children understand abstract concepts, process information, appreciate different perspectives, develop critical-thinking skills, and collaborate on problem- solving (OTA Power On! 23-28).[19]

As a result of public and private support for providing computers and Internet access in US schools over the past decade, a recent report from the National Urban League indicates that there is major improvement in closing the digital divide in 2005. The index in 2004 for blacks at 0.51 illustrated that twice as many white families had Internet access compared to their black counterparts. The 2005 index shows blacks' status at 0.69 or an 18-point improvement compared to whites with home Internet access.

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[19] Consider the following examples given by Apple Computer at the 1993 Congressional Black Caucus Foundation's California Public Policy Conference entitled, *Public Education: A System in Crisis* (White, *Apple CBC*). A first grade boy works at a computer to practice forming words and simple sentences. He types a word. As it appears on the screen, the computer's speech synthesizer repeats the word back to him, so that the child begins to recognize the sounds of consonants and vowels and their combinations. The immediate feedback of hearing the word pronounced as he spelled it helps him recognize his own spelling mistakes. One of his classmates is practicing her penmanship. She traces the shapes of letters with her finger on a computer monitor overlay. If she forms the letter incorrectly, an illustration of the proper pen strokes appears on the screen. Teachers discovered that writing skills improve once students have access to word processing, since it eliminates the time and frustration associated with revisions and corrections and enables young writers to concentrate on organizing their thoughts and refining their style.

The Open Magnet School in Los Angeles, where the *Vivarium* curriculum was implemented, used computers to enable children to create and study plant and animal ecologies to test their hypotheses about nature. Vivarium was a research program working with the Open Magnet School in Los Angeles and led by Ann Marion, Apple Fellow Alan Kay, a team of Apple researchers, as well as graduate students from MIT and Caltech. Its mission was to examine the intuitive thinking of young children and possible implications for computer graphics, user interfaces and artificial intelligence. They used computer animation and graphics to design animals and the environments in which they live, and program the animals' behavioral characteristics. Electronic mail systems allowed students to communicate with other students and teachers around the world. In fact, students were actually connected online with schools in Germany during the time that the Berlin Wall was being torn down. Apple reported that it was incredibly exciting for kids to actually get first-hand reports from people who were living history in the making. Two-way interactive instruction allowed students to see the screen of someone else in another location at the same time that they're looking at their screen. This ability to work collaboratively and interactively over long distances was being tested in Kentucky in 1993, and today it is a standard capability of most personal computers.

The Steel Valley School District near Pittsburgh, Pennsylvania had a business education curriculum that included a small business simulation in which students spent several months managing an institutional supply company. Order and delivery data, sales figures and correspondence are entered onto a database and shared electronically. The students moved away from routine tasks and paper shuffling to problem solving and decision-making.

Likewise, students at Bell High School in East Los Angeles used computer graphics to publish school posters, tickets to events, teachers' lesson plans, tests, the school newspaper, newsletters to parents, and administrative forms. Their experience at school led to several students landing jobs in publishing, graphic design, and advertising.

The experience with computers in education also began to expand into developing countries in Latin America. For example, in Chile, which started to connect schools in a program called ENLACES in 1993, Telefónica provided free Internet access to all schools. By 2001 the project had expanded from 180 schools in the first year of its existence to over 5,000 in 2000 (World Bank 4). Mexico's Telesecundaria program, which, according to Edwyn James, has been adopted by several South American countries, shows how computers in the classroom have transformed life for thousands of secondary school students in rural Mexico. Telesecundaria brings a full educational program into the smallest villages via a television screen or webcast.

Likewise, in a Rwandan building that used to be an army barracks, the Kigali Institute of Science, Technology and Management (KIST) now trains more than 3,000 students. Rwanda's secondary school teachers come there to learn how best to pass on computer skills to the next generation. As well as offering three-year degree courses, the institute also has shorter, fast-track job training programs which are more affordable. Professor Eliphis Bisanda, Registrar at KIST, commented that, "After four months somebody is ready to go and work. This is actually what the country needs now, because the demand for information communication technology professionals and technicians is very high" (Simmons).

So, if the free market 'diffusionists' are right, the combination of decreasing costs of ICT, Open Source software, recycled computers, and entrepreneurial interests will make technology available on a broad scale, and Therefore, government intervention is not warranted to close the digital divide.

Chapter Four

Ubiquitous ICT Access

To give a man his freedom and to leave him in wretchedness and ignominy is nothing less than to prepare a future chief for a revolt of the slaves.

-- Alexis de Tocqueville

If universal access to Information & Communications Technologies were granted to the entire population, would that solve the digital divide problem? Consider what happened when the city of LaGrange, Georgia made access to the Internet free to every household. Researchers from Pennsylvania State and Georgia State University found in 2002 that the lack of adoption of the technology had much more to do with its irrelevance to the lives of the citizens, a distrust of the government, and illiteracy.

LaGrange is a town that had 27,000 residents in 2000 and it is approximately 60 miles southwest of Atlanta. It is home to 35 industrial companies that employed 11,000 people from the town and the surrounding counties. Its need to attract and retain companies that provide employment led to its investment in an advanced telecommunications infrastructure, including an OC-12 sonet ring that served 60 commercial customers[20] (McFarlan 2-3).

Partially to encourage the continued employability of its citizens and to stay competitive as an attractive industrial site, LaGrange was the first city in the world to offer free and fast Internet access to its citizens. It entered into an agreement with the local cable television company, Charter, and an Internet service provider, WorldGate, to offer free Internet service to residential customers of Charter for the first year (McFarlan 4-7). Since 66 percent of homes had cable TV service, the city government felt confident that the free service would serve to reach a broad audience (McFarlan 22). In addition, the WorldGate system did not require a personal computer; it used the cable set-top box, the television, and a wireless keyboard. The system offered electronic mail, chat rooms, games, a community calendar, church bulletins, local government information, local business directory, electronic commerce with local businesses, and access to the broader Internet. Training videos were developed in collaboration with a local university and were broadcast on the cable system (McFarlan 7-18).

In spite of the broad availability, the city's subsidization, use of a television instead of a PC, local content, and training material, WorldGate had limited success. The researchers concluded that:

> Based on our analysis, we believe that providing access to IT -- even access that is delivered for free to the home -- is insufficient to adequately address the digital divide. While the Free Internet Initiative produced some limited success, public policy makers in LaGrange were surprised that the initiative was not more successful. In terms of bridging the digital divide, it would appear that while the Free Internet Initiative has had some positive impact on the community, it has been difficult to motivate the majority of the target households to adopt the system. In hindsight, it appears that they had an unrealistic, and in some ways naïve, view that providing free access to technology would, by itself, be enough to bridge the digital divide" (Keil 8-9).

[20] OC-12 stands for Optical carrier. It conforms to the SONET communications standard and provides services at 622.08 Mbps (622,080 bits per second).

As of April 29, 2001, almost one year from its launch, only 4,137 of the 9,100 eligible households had ordered the system. City officials had hope for 6,000-7,000 units. (McFarlan 7). Of the households that adopted the system, less than 40 percent had no previous access to PCs at work or at home. A WorldGate survey found that the average usage of the system was 7.2 hours per week and that 51 percent of the users were very satisfied and 20 percent were dissatisfied. The satisfaction ratings were higher for those with little or no computer and Internet experience and lower for those familiar with PC-based Internet access (McFarlan 9). Of the 4,100 units installed, 450 cancelled the service (McFarlan 16).

Some of the reasons for the mediocre success of the trial can be found by a close examination of Worldgate's 20001 survey. The system was designed for novice users, but only 33 percent were novices. Ninety four percent had some prior experience with PCs, the average of which was 3.3 years using the Internet prior to subscribing to WorldGate (McFarlan 19). Those with PCs either at work or at home or both accounted for 63 percent, and they compared the WorldGate's limited performance, lack of a printer, and the frequent cable outages with the more pleasing experiences that they had. Also, the use of a television as the monitor, though meant to provide ubiquity, actually caused competition among those who wanted to use WorldGate and those who wanted to watch TV.

The LaGrange initiative did reach an additional segment of households without access to PCs. Thirty-seven percent of the subscribers lacked access to PCs at work or at home. These included seniors over the age of 60 (17 percent), persons without at least some college education (74 percent), and those with incomes below $25,000 (33 percent) (McFarlan 20-21). However, the goal of encouraging workforce education for those in the lowest socio-economic status was not met. Mayor Tom hall explained, "We went door to door with our installers on Saturday at a public housing project and nobody was interested. What we've found is just hesitancy, a lack of understanding, a lack of appreciating what it potentially means and breaking through that" (McFarlan 10).

The City Councilman who represented the district with the housing project explained it simply as, "If they don't need it, they won't get it," observed Willie Edmondson. "Many residents didn't know about the system. They thought it was a gimmick, or they just voluntarily chose not to participate because they may not have realized the benefits," cited Tonyka Bartley, as resident of the housing project (McFarlan 10).

An additional explanation centers on the cost. The 'Free Internet Initiative' was not really free. To get the free system, one must already be a cable subscriber at a cost of $8.70 per month. There were also concerns over what the price would be for the WorldGate system when the 'free' year of usage was over (Keil 7). Costs that would not deter more affluent consumers may represent obstacles for the less affluent (Keil 8).

Harvard's Warren McFarlan and Georgia State University's Mark Keil write in their analysis of the LaGrange case, "One possible interpretation of these findings is that LITV may not have as much potential to address a perceived or real digital divide in LaGrange as the city had hoped. Households already exposed to information technology – and presumably already aware of its productive and beneficial uses – made up most of early LITV customers. Information technology adoption is more about understanding the value of technology than about cost. Even offering free access to the Internet is not enough to get many nonusers to take it up (in part, as one of the case studies suggested, because of suspicions that the service was really not free)" (McFarlan 24). The LaGrange experience shows that the 'free' service peaked the curiosity of those who wanted to learn about the Internet, but did not have the resources to access it; but it had no affect on those who saw it as irrelevant and of low value to their lives.

In the mid-1980s, the grassroots work at the Cincinnati NTA also demonstrated that one should not be so presumptuous as to believe that technology will solve all of our educational problems.[21] The NTA found that technology cannot solve the problems of school funding,

[21] When the first warning signs of a digital divide were being noticed in the early 1980s, I had the pleasure of working with Dr. Allan Letton, one of the few black polymer chemists in the world, on a study for the NTA on the root causes of "technical illiteracy." We found that the statistics on African-Americans in engineering were dismal. Of the 1.4 million engineers in America in 1981, blacks represented only 0.93 percent of the total while 14 percent of the US population was black. Of the advanced engineering degrees awarded, only one percent of the masters and 0.56 percent of the doctorates went to blacks. Blacks were awarded only 2.3 percent of the 62,839 Bachelor of Science degrees in 1981. One-third of

institutional racism, of teachers who may not truly believe in the innate learning ability of all children, of parents who may not stress the value of education, a lack of self esteem, family or community problems, or lack of motivation by the student. Computers cannot be a substitute for human contact, role models, encouragement, and love.

Even when pilot projects seem promising, the digital divide can reassert itself due to human behavior. The OECD cites a report by Bjorn Soren Gigler of the World Bank about a project in the Peruvian Amazon:

> Projects to bring ICTs to rural and underserved populations can have limited success if certain social issues within the community are not sufficiently addressed. In 2000, IDRC Canada and Red Cientifica Peruana established an Internet telecentre in the Peruvian Amazon in Marakiri Bajo as a way to preserve the indigenous culture and improve access to education, markets and politics. Marakiri Bajo had no running water or electricity and the telecentre was established using a generator and satellite communication links. One of the key components of the project was a video conferencing system that allowed people to access courses from educational institutions across Peru.
>
> While the telecentre was intended to service the whole community of both indigenous Asháninka and newer inhabitants, the 'mesticos,' it was operated and used dominantly by the Asháninka. The result was non- Asháninka and people in surrounding communities were reported to feel excluded from the centre and the services it offered. In August of 2001, the telecentre burned down and the circumstances around the fire were unclear. The surviving equipment was eventually put to use to power a local radio station instead of another telecentre" (OECD *Regulatory Reform* 9).

The computer cannot be offered as the total solution, but as an important classroom tool that can empower teachers, administrators, and students. As CERI's Edwyn James would state it, "It has become increasingly clear over the past two years that offering the whole world a phone and a computer screen will not in itself help bridge the 'digital divide' opening up across the world. The technology is practically worthless unless people are equipped with the know-how, and the willingness to use it. Those who cannot use it confidently, whether whole countries, groups or individuals, will become increasingly marginalised within the modern world" (James).

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the blacks that started in engineering curricula as freshman never finished their BS degree requirements. Black enrolment in medical schools had declined in the previous two years and law school enrolment had stagnated. All of this was occurring at a time when more than one-half of the jobs in America were projected to not even exist by the year 2000, and those that were expected to exist would require higher levels of education. We found that less than one American high school student in ten took even one year of Physics. Only one-third of US high school graduates completed three years of mathematics. Less than eight percent completed a calculus course and less than one-third of US high schools even taught calculus. Of the 60 percent of students enrolled in general and vocational programs, only 20 percent graduated with three years of mathematics, and only one-third of the nation's school districts required more than one year of mathematics for graduation (Letton, *Minorities in the Profession*). We found that computers alone would not solve this problem.

Chapter Five

Distributive Justice in the Information Revolution

Chance favors only the prepared mind.

-- Louis Pasteur

Though the 'access divide' is closing, the 'structural digital divide' is widening. Might that imply that the popular use of the term digital divide is ill defined or might it lead us to re-evaluate the underlying assumptions of what distributive justice means in a technologically intensive society?

The widening socio-economic gap is due to a major technology-enabled shift in the nature of education, work, and governance on a scale equal to other great technology-enabled revolutions. Therefore, distributive justice is no longer just about access to computers; it concerns the distribution of social benefits and burdens relevant to the long-term well-being society. Distributive justice allows society to override some individual property and autonomy rights, if doing so maximizes everyone's interests (Beauchamp 340-348).

Western society has had to deal with these sorts of structural economic and social changes before. Scientist and writer Lord Charles P. Snow (1905-1980) attributed "the only qualitative changes in social living that men have ever known" to the "agricultural and the industrial-scientific" revolutions, and the technological advances that enabled them. "For, of course, one truth is straightforward. Industrialization is the only hope of the poor" (Snow 22-23).

Britain was the first major country to base itself on an industrial and commercial economy. As the population migrated from the countryside into the cities in the eighteenth and nineteenth centuries, social and political institutions formed to deal with this new situation (Budge 7). Political institutions also sought to meet the interests of the commercial class and their sustained need for workers. The Industrial Revolution's abject poverty, overcrowding, and risks to the public health as well as to the labor supply led Britain to establish itself as a liberal democracy, which, by the early 1900s, also began to recognize the needs and rights, not just of the landed gentry and the commercial class, but also the industrial workers.[22]

One of the most significant arguments put forth by the trade union movement was that workers' wages were not just a commodity price to be set by the market. Competing workers driving the costs down also meant increased human misery in terms of poverty, health, family stability, crime, and problems that would affect the whole society (Budge 48). In addition, according to Budge, "The mass unemployment of the 1930s had demonstrated how inadequate social protection was in the absence of comprehensive state aid." This was more than lobbying by the unions. It was a powerful ethical argument of the intrinsic worth of the individual that set the foundation for an accepted policy of a social safety net (Budge 625).

The post-war Labour governments of 1945-1951 unified social protection and health care into a body of legislation called the 'Welfare State'[23] (Budge 8-9). By the 1980s the New Right's

[22] David Lloyd George's Conservative coalition government passed the Insurance Act in 1912. Stanley Baldwin's Conservative government introduced a widow's pension scheme in 1925 and modified the 19th Century's Poor Law under the Local Government Act of 1929 (Childs 8). The Labour Party was formed to address many of the needs of the working class and it adopted a socialist constitution in 1918 that was committed to common ownership of the means of production, distribution, and exchange. However, Labour opposed Soviet-type communism because ethical principles were the basis of their socialism, rather than Marxism (Childs 9).

[23] The state used public funds to provide a minimum standard of living or 'safety net' of cash benefits, job training, insurance, and health care for its citizens. According to Budge, "The basic aim was to ensure that everyone got support in all the major crises of life: poverty, sickness, old age, and unemployment" (Budge 9). The Labour government of 1945 also nationalized certain industries, strengthened regional policies, focused on maintaining full employment through active Keynesian macroeconomics, and developed the 'Welfare State,' which stayed in place until the 1980s (Budge 60-61).

doctrine of 'Thatcherism' and its belief that the market was more efficient than the state at providing everyone with goods and services, caused it to ignore or refuse to intervene in the closing of factories and mines concentrated in the north. They also sought to reduce the number of government employees from 700,000 to 590,000 (Budge 13). The subsequent dislocations set the stage for Labour to return to power after an 18-year absence, but with a new twist – the 'New Deal.' [24]

Tony Blair's Labour Party came to office in 1997 and accepted both the EU's Monetary Union and Social Chapter, which, as noted by Budge, provided "an unprecedented opportunity for Labour governments to pursue their policies with the consent of both industrial and financial interests…and advance its social policies without creating a crisis of confidence" (23). Unlike previous Labour governments, Blair supported the idea of increasing the size of the national economy to the benefit of all of the UK's citizens (Budge 77). Therefore, Labour was no longer opposed to private education, private provision of transport, and owner occupied housing, and it sought to move the social safety net in the manner of Bill Clinton in the US – from welfare to work.

Today, through technology-enabled globalization of work, society stands in the midst of another significant economic transformation that brings with it tremendous social upheaval and competitive claims on resources. While one could easily applaud the admirable goals of those who seek to close the digital divide by making ICT more available to the poor, they may not have adequately taken into account the structural changes in the nature of the economy.

Over the past 30 years, the United Sates and the developed world has been impacted by global economic restructuring facilitated by ICT. Free market purists, such as the Cato Institute's Dan Griswold, tend to theorize at the macroeconomic level regarding the impact of technology on the dislocation of individuals. Paraphrasing Griswold, technology tends to shift resources to sectors where worker productivity (relative to wages) and returns on investment are higher compared with other domestic industries, while eliminating jobs in less productive and less profitable sectors. Technology forces less efficient producers to either modernize their production processes or face bankruptcy. The capital and workers forced to leave the declining industries can then be employed in industries that are more efficient, competitive, and profitable (Griswold 3). But even Griswold noted in 1999 that the negative impact of technology is unevenly distributed:

> Even the most ardent proponents of free trade will grant that its benefits, although almost always outweighing its costs, are not universally distributed. Along with the many winners come a smaller but still real number of losers: people whose jobs are indeed put in jeopardy and even eliminated by competition from imports. For those people, the benefits of lower prices, higher quality, and wider consumer choices can be swamped, at least temporarily, by the trauma of losing their jobs (Griswold 1).

Griswold's colleague Brink Lindsey, also of the conservative Cato Institute, noted that, "Even in good times, job losses are an inescapable fact of life in a dynamic market economy. Old jobs are constantly being eliminated as new positions are created. Total US private-sector jobs increased by 17.8 million between 1993 and 2002. To produce that healthy net increase, a breathtaking total of 327.7 million jobs were added, while 309.9 million jobs were lost. In other words, for every one new net private-sector job created during that period, 18.4 gross job additions had to offset 17.4 gross job losses" (Lindsey 1). Such macroeconomic abstractions of the livelihoods of individuals blur the real consequences for the 310 million job losers.

It is also Griswold who highlights the direct link between technology and the number of people displaced, "Technological change and other nontrade factors account for most of the

[24] Unemployment reached 12 percent in the mid-1980s and it rose again in the mid-1990s. In addition, though Britain signed the European Union's Maastricht Treaty, the Conservative government of John Major opted out of the EU's Social Chapter, which sought to give social rights to workers and ensured a level base for competition (Budge 22). The Social Chapter of the Maastricht agreement established a broad set of regulations on social conditions, working hours, minimum wages, and health and safety standards. The Chapter was not signed by the Conservative government, but has since been accepted by the Labour government (Budge 217).

workers displaced from their jobs each year" (Griswold 1). At the same time, it is technology that opens the door to new economic opportunity. The Department of Labor is forecasting a 35 percent increase in computer and math related jobs over the next decade (Hecker 83).

In the past, strategic resources were the natural materials that were turned into manufactured products. Today, information and ideas from workers are the strategic resources that improve productivity. The result is that the segments of the American population that lacked education and skills for the new technology-based economy went from resource-rich to resource-poor virtually overnight.

The old manufacturing-centered, mass-production, Industrial Age model in which work was broken into simple repetitive tasks required little training or knowledge. In the old model of work, the US had a managerial class based on the command-and-control model. And it had a working class that wasn't expected to think. Consequently, the nation's education requirements were low by today's standards. Ray Marshall, former US Secretary of Labor, said there are three options when it comes to using technology in the workplace. First, we can have unskilled workers, managed by the elite, and supervised by bureaucrats. Second, we can have illiterate workers, using leading edge technology to compensate for their lack of skills.[25] The third option is to have well-educated workers using leading edge technology (Adamson).

Lindsey notes that, "Management and professional specialty jobs have grown rapidly during the recent era of globalization. Between 1983 and 2002, the total number of such positions climbed from 23.6 million to 42.5 million -- an 80 percent increase. In other words, these challenging, high-paying positions have jumped from 23.4 percent of total employment to 31.1 percent. According to the Bureau of Labor Statistics, projections for 2002–2012 are that management, business, financial, and professional positions will grow from 43.2 million to 52.0 million, a 20 percent increase (Lindsey 4). Economist Daniel Hecker notes that, "Within this occupational group, about one-fifth of the new jobs will be in professional, scientific, and technical services, which include management, scientific, and technical consulting, and accounting, tax preparation, bookkeeping, and payroll services" (81). However, even though the vast majority of all jobs in the global economy do not yet require a college degree, they demand an enormous amount of training so that the front line employees can adapt quickly and effectively to new processes and new technologies.

So, the change from an industrial to information economy is as sure and as troubling as the change from an agricultural to an industrial base. As Heidegger reminds us, one cannot avoid technical culture. Trying to do so will keep humanity from realizing the potential of 'salvation' and, instead, cause it to fall into the 'danger' of technology. "Man will never be able to experience and ponder this that is denied so long as he dawdles about in the mere negating of the age" (Heidegger 136). In a manner very similar to Heidegger, Lindsey summarized the options ahead for workers in the global technological economy:

> In recent years, many Americans have lost their jobs and suffered hardship as a result. Many more have worried that their jobs would be next. There is no point in denying these hard realities, but just as surely there is no point in blowing them out of proportion. And regardless of whether economic times are good or bad, some amount of job turnover is an inescapable fact of life in a dynamic market economy. This fact cannot be wished away by blaming foreigners; it cannot be undone with trade restrictions.
>
> Public policy can lessen the pain of economic change. It can ease workers' transitions from one job to another; it can produce better educated and better trained workers who are capable of filling higher-paying, more challenging positions; it can promote sound growth and avoid, or at least minimize, economy-wide slumps. But there is no place for policies that seek to stifle change in the name of preserving existing jobs.

[25] For example, when one goes into a fast food restaurant today and sees a hamburger symbol on the cash register, one knows that the cash register has enough intelligence in it to work out the price of the item and the number of times the button was punched, so there is no reading or counting required by the unskilled worker.

> The innovation and productivity increases that render some jobs obsolete are also the source of new wealth and rising living standards. Embracing change and its unavoidable disruptions is the only way to secure the continuing gains of economic advancement (Lindsey 11).

The new global information-intensive economy needs workers that can quickly adapt to changes in the marketplace and make critical decisions at lower and lower levels of the work force hierarchy. In fact, today people can expect to have four or five different careers during their working lives, as opposed to having one job on an assembly line doing the same task over and over in a machine-like fashion. It is a very different world in front of us, and those in disadvantaged communities need to make systemic changes to at least get on the first rung of a technologically-based economic ladder.

Since lifelong learning and skills retraining are required, policies that seek to close the digital divide would make new technologies and educational tools available to anyone, anytime and anywhere. Apple's former Chairman, John Sculley, best described a vision for education in saying, "By the end of this century [the Twentieth Century], we want to create in this country a true learning society -- where learning is not bound by the age of the students, or the walls of the institution, but where it is a lifelong process rich in knowledge and rich in enjoyment" (White). Much of this technology is already here and is, or will be, adopted for this purpose. This includes multimedia, two-way video conferencing, portable wireless technologies, intelligent agents, and high-speed digital communications networks. The National Information Infrastructure, as it was called during the early days of the Clinton Administration, is now what has become the World Wide Web and is one of the essential pieces in leveling the playing field by allowing access to the same educational and research resources for all.

Sculley argued that in the information age, the ability to exchange information not only with classmates but with the city library, commercial databases, bulletin boards, or even the Library of Congress can help students develop lifelong skills for accessing and handling information (White). In barely 10 years, the personal computer evolved from a classroom novelty to a widely used instructional tool.[26] Today, Apple's predictions of a student using computer to explore a virtual museum, moving room to room, examining exhibits via long-distance interactive three-dimensional movies has come true. New technologies, such as multimedia and distance learning with telecommunications technologies, are ways of leveraging our best teachers, our best schools, and giving the educational reform movement a chance to take hold in a place where it can be most effective-- the classroom. The technology exists to accomplish all of these tasks, but the question of equitable access remains.

Sculley argued that this technology cannot be available only to the affluent. America must avoid the trap of "haves" and "have-nots." Inner-city schools and deprived rural areas must also have access. The popular myth that kids who have not grown up with the same advantages as affluent kids are unable to learn at the same rate has been disproved. What children from disadvantaged backgrounds need is a chance to be exposed to the kind of mind-amplifying tools that more affluent kids have. That is a very important finding for the nation because we are a multicultural, very diverse population and America has to build on that strength (White).

However, reforming the US work and education models has not and will not be easy. Among other things, it requires investments. This country invested in interstate highways, electric power grids, network television, and national newspapers, for the purpose of increasing access to physical resources. In the same way, the new education system requires investment, one that is as important as any investment ever made in the infrastructure of this country. However, those educational investments should not be simplified into the tangible artifacts of computers and

[26] Using computers for learning is different than the traditional way of teaching, because it offers an interactive environment for the user. The personal computer is a tool with which one can try things, make mistakes, and learn through trial-and-error. The act of doing something is a far more effective means of learning. The computer's graphics capabilities offer an important advantage to students who learn best with visual reinforcement. Interactive multimedia is computer-centered learning that combines text, action and still pictures, animation, sound and music to produce a learning environment that is rich in sensory content. Such environments accommodate students' individual learning styles and give them a chance to experience what they are learning --a key component in comprehension and retention (White).

networks alone; human capital development has to be the goal of education. This will directly affect the quality of life, our productivity as a nation, and America's ability to compete in the new global economy information-age economy.

Chapter Six

Insufficiency of ICT

If the only tool you have is a hammer, every problem is a nail.

-- Abraham Maslow

If access to Information & Communications Technology is made available as a part of a progressive government plan to assist in closing the access gap, rather than leaving it to raw market forces, what are the likely benefits and disadvantages? The Internet can no longer be seen as the sole domain of ICT experts. It has evolved into a global resource and, like other global resources, divisions have emerged over how best to exploit it.

ICT has been elevated by some proponents, beyond consumer technology, to a fundamental vehicle for obtaining economic, educational, and social justice. "We want to take the telecenters to the poorer areas in the periphery, to reduce the social and economic divide," said Beatriz Tibirica, coordinator of a Brazilian project called E-Government. "Access to technology is fundamental in order to get full rights and opportunities in modern society", she added (Bacoccina).

According to the World Bank's report issued at the 2001 Summit of the Americas, information and communications technologies are critical to the economic development of societies. Therefore, ICT became widespread in many developing countries during the 1990s, with annual rates of investment doubling between the first and second half of the decade (World Bank 1). In addition, the World Bank believed that ICT offers new avenues for economic development of special relevance for the poor in economic opportunity, inclusiveness, and provision of government services:

- Economic opportunities. Electronic commerce through the Internet opens up substantial new areas of international trade to developing countries. Two sectors with great potential to benefit are service industries, many of which are becoming tradable commodities for the first time, and small and medium enterprises, which benefit from the low cost of access to the global marketplace.
- Costs of exclusion. ICT services can substantially reduce the costs of distance and isolation borne by poor, especially rural, households, whose members must often travel long distances to communicate, and obtain vital information. Their isolation causes them to miss out on employment and other economic opportunities.
- Improving government and public services. ICT offer powerful tools to improve the efficiency, quality, and reach of public services that are important for poverty alleviation, such as education and health. ICT can also broaden political participation and increase the transparency of government 1. (World Bank 1).

However, the World Bank's *World Development Report 2000/2001* found that, while almost a third of people in industrial countries had access to a computer in 1998, barely three percent of the developing world had access. Likewise, the OECD reports that the digital divide has been most pronounced in the lowest income areas of the world. Often, the lack of basic network infrastructure significantly hampers the adoption of new technologies. Internet technologies, which often require an expensive outside connection from the country to the world, have been particularly slow to reach users in low-income economies. As an example cited by the OECD, the total population of Liberia must share an international Internet connection of just 256 thousand bits per second (256 Kbps), the equivalent of just one baseline residential broadband connection in the OECD countries. Other developing economies face similar bandwidth constraints. A single 100 million bits per second (100Mbps) broadband user in a leading broadband country such as Japan or the US has access to as much international connectivity as the 45 countries with the lowest international connectivity combined (OECD *Regulatory Reform* 7).

By 2001, the World Bank warned that governments could not rely on the power of markets alone to address the digital divide. Distance and low income of rural communities limit their appeal to private sector operators. The private sector tends to concentrate ICT investment in a few markets, and only in attractive segments of those markets. For example, Latin America and the Caribbean received over US$20 billion in investment in private telecommunications projects in 1999. The Middle East, South Asia and Sub Saharan Africa received, by contrast, between $1–$2 billion in ICT investments. Within countries, ICT investments were concentrated in more profitable services for relatively well-off urban users (World Bank 1).

According to the OECD, The combination of low literacy levels and low bandwidth presents policy makers in developing economies with a bandwidth paradox. Users in developing economies often do not have literacy or ICT skills sufficient to take advantage of low-bandwidth text communication. Illiterate ICT users require audio and video technologies to take advantage of ICTs, helping to partially explain the rapid take-up of mobile telephony in developing economies. However, users in developing economies have such limited access to bandwidth that usually their only choices for communication are text-based. The result is an entire segment of the population underserved by text-based communication technologies (OECD *Regulatory Reform* 8).

In response to the Global Digital Divide Initiative of the World Economic Forum Task Force, the G-8 Okinawa Summit in July 2000 launched the Digital Opportunity Taskforce, called *Dot Force*. Dot Force was a collaboration among government, international organizations, industry, and the non-profit sector, to examine concrete steps to integrate the various efforts to bridge the international Digital Divide. The eight industrialized nations -- Canada, France, Germany, Italy, Japan, United Kingdom, the United States, and Russia -- acknowledged the advancement of the private sector in information technology and shared the vision of ICT's ability to affect key development areas of society. According to Cheryl Brown, they believed that "civil society's digital empowerment is a main base of development in the age of information and technology." Therefore, the G-8 agreed that, "global electronic commerce and pro-competitive telecommunications policies would catapult the shift to active, long-term, self-sustaining economies of the information age" (Brown 1).

To the United Nations General Assembly, ICT is a not a luxury. Their 2002 report of the UN ICT Taskforce argued that, "Greater reliance upon this can do much to facilitate the work of governance, to promote economic opportunities and to improve education and health. ICT is not an alternative to other expenditures but is a requisite tool for development. Not only are the new technologies a key to unlocking economic growth; they impinge on and can impact virtually all aspects of development. It thus deserves priority attention even in conditions of limited infrastructure and budgets" (UN 1).

Likewise, the World Bank declared in its 2000 World Development Report that,
"Information and communications technologies are central to the war against poverty. They stimulate economic growth, create wealth and improve services for the poor. They increase the incomes of the poor by opening and improving markets. They provide a channel through which the voices of the poor can be heard. They speed warnings of and responses to security threats, such as natural disasters, environmental problems, harvest failures and epidemics. With ICT, countries increase productivity of other sectors, including social services. Without ICT, countries fall further behind in the struggle against poverty. Today the choice cannot be health or ICT, education or ICT. It must be health, education, and ICT" (World Bank 2). British Prime Minister Tony Blair declared in his keynote at the 2000 World Economic Forum in Davos:

> What makes sense for the industrialized world is imperative for the developing world – 150 million children of primary age in developing countries do not go to school and over 900 million adults, two thirds of whom are women, are illiterate. The bane of all modern developed nations is social exclusion – a group of people, set aside from society's mainstream – who need to be offered a deal, not some more benefit. The next step is to get the new information technology to the poor as well as to the comfortable" (Gage).

The digital divide is not simply a matter of the 'haves' at an advantage, to paraphrase Edwyn James, but the 'have-nots' are at increasing risk of social and economic exclusion. Countries which lack a firm ICT infrastructure become marginalized as electronic commerce grows in importance. "They are incapable of sharing in the new route to prosperity which e-commerce affords, and remain dependent on the export of basic commodities, for which the world price is often in decline," notes James.[27]

Philosophical theories of justice attempt to resolve questions of distributive justice by providing explanations as to why distinctions are made in any unequal distribution of benefits and burdens (Munson 37-38). According to Robert McGinn, distributive justice is a trumping factor over strict utilitarian standards (McGinn, *Ethical Issues* 12-13). Therefore, a just Rawlsian society is not one where everyone is equal, but one in which inequalities must be demonstrated to be legitimate. Most importantly, John Rawls argued that everyone must be given a genuine opportunity to acquire membership in a group that enjoys special benefits (Munson 22-23). So, the moral argument should not be restricted to the distribution of computers, but it needs to be expanded to address the *distribution of relevant benefits*. Therefore, the moral question that needs to be addressed is to what extent should market forces be allowed to create an unfair distribution of benefits when the digital divide is not just a case of technology diffusion, but a profound change in the social and economic foundation for global society, and Therefore, each person has a right to basic communications and educational infrastructure?

Since the digital divide is not about the distribution of technology, but about the *distribution of opportunity* in a technology-enabled global economic and social order, is it ethical to allow major sectors of the population to be marginalized as a result of technological change? A raging debate centers on what can be done globally to alleviate the digital divide, provide a fairer distribution of ICT benefits, and minimize the alienation and dislocation that accompany new technology implementation.

A *Rawlsian* approach to ethics would not allow one segment of the population to benefit at the expense of another. A revised hierarchy of material principles of distributive justice would enable a more just distribution to a globally needy underserved population. Traditional philosophical approaches suggest allocation of scarce resources based on (Beauchamp 228):

1. To each person an equal share (egalitarian)
2. To each person according to need (beneficence[28])
3. To each person according to effort (cost effectiveness)
4. To each person according to contribution (scientific utility)
5. To each person according to merit (social utility)
6. To each person according to free-market exchanges (libertarian)

"Most societies invoke several of these material principles in framing public policies, appealing to different principles in different spheres and contexts," according to Beauchamp and Childress, however, in the United States, it seems that an over reliance on fee-market exchanges has led to a defacto allocation scheme internally, and a denial of resources and services to those external countries and cultures who cannot afford to pay inflated, profit-oriented, US market rates (Beauchamp 228-229). This conflicts with the well-established sense of justice and fairness espoused by Rawls.

The implications of Rawls' principles are that everyone is entitled to the infrastructure of communications, information, and education. Inequalities in the technology diffusion system can be justified only if those in most need can benefit from them. To the degree that the previous two conditions are not met, as in the digital divide, a wholesale reform is called for that would provide ICT infrastructure to those who are unable to pay (Munson 24-25).

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[27] For example, Africa's share of world trade fell from about 4% in 1980 to less than 2% by 2001, according to IMF figures (James).

[28] *Beneficence* requires that policymakers act in ways that promote the welfare of the public. It is not enough to 'do no harm;' a practitioner must proactively seek to work on behalf of society's best interests (Munson 34-35).

A more globally fair distribution might be based on the following hierarchy of principles and assumptions, in this explicit order:

1. Egalitarian. If resources are still constrained, then…
2. Social utilitarian. If resources are still constrained, then…
3. Scientific utility. If resources are still constrained, then…
4. Individual beneficence. If resources are still constrained, then…
5. Cost effectiveness. If resources are still constrained, then and only then…
6. Libertarian, especially as it relates to technology in support of individual desires…then
7. Lottery, as a tie-breaker

Under Rawls, as well as the *Harm Principle* and the *Welfare Principle*, the rich would not be permitted to exploit the poor who need life's physical basics and basic ICT infrastructure.[29] Another principle that would work toward making ICT available globally on a fairer cost basis is to require ICT companies to adhere to what Paul Farmer calls a *uniform ethic* in return for the extraordinary privileges granted to their industry by society. Since the ICT industry benefits from publicly funded research, government-granted patents, and R&D tax breaks, and since it makes products vitally important to public communications, it should be accountable to society at large, rather than just to its shareholders. Farmer argued for this uniform ethic for the pharmaceutical industry, and it seems like an appropriate extension to ICT companies as a condition for entry into any national and international marketplace (Farmer xxvii).

In providing Rawlsian-style benefits to those most negatively affected by technological change, how should opportunity be provided? In education, are skills training enough or must one be trained for full empowerment in the new social order? In economic development, is it adequate to provide an opportunity for a job in the digital economy, or must one be given the ability to produce? Is it enough to provide the twenty-first century equivalent of the civil rights won in the 1950s and 1960s, e.g., the vote, nondiscrimination in public services, equal access to education, nondiscrimination in employment, or must one be made a fully capable player in participatory democracy and the global economy?

Can increased access to computers and the Internet make a difference in the 'real digital divide'? As Edwyn James stresses in reference to computer-based educational experiences in Mexico, "In every case, the Mexico model has worked largely thanks to the combination of well-qualified tutors at the transmitting end of the system, and local 'persuaders' in the rural areas to win the students over to this novel educational method. Computers alone are not enough to join the e-economy. Digital literacy is essential too" (James).

India provides a vivid example of how an educated population can position itself to take advantage of new technological developments. Its has come a very long way from its pre-1947 ruler by the British Raj, under which India's literacy was only 17 percent, life expectancy was 32.5 years, and its industrialization was designed to supply raw materials for British mills (Sachs, <u>End of Poverty</u> 174). Due largely to the massive investments in global broadband and satellite communications infrastructure prior to the 2000-2001 high technology crash – referred to as the 'dot com' bubble – plus the falling prices of computers, intellectual work can be done from virtually any place in the world. India, with its middle class of over 300 million, its large cadre of literate highly-trained professionals, and its low cost structure, is successfully competing for outsourced global knowledge work, not because the technology is there, but because trained, literate, English-speaking doctors, accountants, engineers, and software developers are able to use the technology.

As observed by New York Times columnist Tom Friedman, "India is a country with virtually no natural resources that got very good at doing one thing – mining the brains of its own people by educating a relatively large slice of its elites in the sciences, engineering, and

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[29] Under the *Harm Principle*, society may restrict the freedom of people to act, if the restriction is necessary to prevent harm to others. The *Welfare Principle* holds that it is justifiable to restrict individual autonomy if doing so will result in providing benefits to others (Munson 43-45).

medicine." In the fifty years since their founding by Jawaharlal Nehru, "Hundreds of thousands of Indians have competed to gain entry and then graduate from these IITs [Indian Institutes of Technology] and their private sector equivalents (as well as the six Indian Institutes of Management, which teach business administration). It's like a factory, churning out and exporting some of the most gifted engineering, computer science, and software talent on the globe" (Friedman, World 104). India's business schools produce an estimated 89,000 MBA graduates per year (Friedman, World 31).

A generation of Indian engineers and entrepreneurs took leadership positions in Microsoft, McKinsey & Company, Citigroup, investment banks, IT firms, and other major international companies (Sachs, End of Poverty 179-180). Those overseas Indian executives established business relationships back in India. When the US and European high technology downturn occurred in the early 2000s, India's low cost structure, its highly-educated middle class, and its well-placed expatriates allowed it to take advantage of the global technology infrastructure that had been put in place.

There are over 245,000 Indians staffing call centers providing customer support and telemarketing (Friedman, World 24). In 2004, 100,000 US tax returns were prepared in India. The projection for 2005 is that 400,000 returns (Friedman, World 13). While a medical transcriptionist in India may only earn $250 to $500 per month, about a tenth to a third of what one earns in the US, their income is more than twice the earnings of low-skilled industrial workers and perhaps eight times that of an agricultural worker in India (Sachs, End of Poverty 15).

Indian technologists are also changing the rules of innovation. Whereas Indian software development may have started with outsourcing the tedious computer remediation work associated with the Y2K bug prior to the turn of the century, today, India is delivering complex high-quality information systems and the country has its own version of Silicon Valley in Bangalore. Where research and design have been the purvey of European and American multinationals who perhaps outsourced their manufacturing to developing countries, Indian R&D centers have been formed by Cisco, Intel, IBM, Texas Instruments, GE, Microsoft, and others. One thousand patents have been filed with the US Patent Office from these companies' Indian R&D units. The Texas Instruments team in India has been awarded 225 US patents (Friedman, World 30).

Economist Jeffrey Sachs notes, "India's export boom has continued to deepen, extending from traditional IT operations (basic software, data transcription, telephone call centers) to increasingly sophisticated business process outsourcing. US and European firms in the health, insurance, and banking sectors are increasingly resorting to the BPO route to cut their costs." And the export boom is not just in IT, according to Sachs. "One of the most dynamic new export sectors is automotive components, where India is becoming the location of choice for many major global producers of automobiles" (Sachs, End of Poverty 182).

Though massive amounts of poverty still exist in the Indian subcontinent, globalization of trade, manufacturing, and outsourced services seems to be good for the overall economy of the region. The World Bank's statistics indicate that in South Asia – primarily India, Pakistan, and Bangladesh – in 1990 there were 462 million people living on less than one dollar per day. By 2001, that number was down to 431 million and it is projected to be down to 216 million by 2015[30] (Friedman, World 315). "The jobs are going to go where the best educated workforce is with the most competitive infrastructure and environment for creativity and supportive government. And by definition those people will have the best standard of living," observes John Chambers, the CEO of Cisco Systems (Friedman, World 323). ICT availability and Internet access are critical to India's success, but ICT alone is insufficient. As Friedman notes, "India was lucky, but its also reaped what it had sowed through hard work and education and the wisdom of its elders who built all those IITs" (Fiedman, World 113). India was prepared to take advantage of ICT when it arrived. "I saw firsthand, repeatedly," says Sachs, "how India's ability to take advantage of the new IT

[30] In contrast, in Sub-Saharan Africa, where globalisation of trade, manufacturing, and services has been slow to develop, the poverty rate is projected to move in the opposite direction. In 1990, 227 million people lived on less than one dollar per day. That number grew to 313 million in 2001 and it is expected to reach 340 million by 2015 (Friedman, World 315).

possibilities resulted from its long-standing investments in higher education, especially in the Indian Institutes of Technology" (Sachs, End of Poverty 186).

The OECD member countries have emphasized ICT skills in their efforts to connect all schools to the Internet, train students in ICTs, and provide programs for non-students to obtain computer literacy. According to a 2005 OECD report, these efforts have paid off handsomely in countries such as Korea where a strong government push to supply ICT training to those affected by the 1997 financial crisis has helped fuel PC and broadband adoption (OECD *Regulatory Reform* 21). Policy makers in non-OECD countries have created similar plans and have boosted penetration rates. One such economy is Estonia where government initiatives aimed at promoting a computer-literate generation have been successful. According to the OECD:

> Estonian policy makers have been successful developing a broad base of ICT skills throughout the country. The government's flagship program*, Tiger Leap*, has successfully integrated information and communication technologies into classroom instruction, resulting in a new generation of students with computer skills who demand faster Internet connections, better content and more extensive telecommunication network coverage. In Estonia, introducing students to computers early in their studies has also helped move more students towards technical careers later.
>
> The results have been impressive with Estonians achieving penetrations equal or higher than other richer countries in Europe. In June 2004, TNS Emor Internet usage surveys show that 52 percent of Estonians between the ages of 6 and 74 use the Internet. The same study finds that the most active Internet users are people between the ages of 12 and 24, 90 percent of whom use the Internet. The percentages are also high for primary school students where two-thirds of students between the ages 6 and 9 are Internet users.
>
> In addition to teaching ICT skills early to students, Estonia's policy makers have made promoting ICT use a priority. One example is new street signs giving the direction and distance to the nearest public Internet access point. The signs are marked with '@ Internet', an arrow and the distance to the nearest of 700 public Internet access points across the country. The government has also taken a proactive approach to integrating computers and telecommunications into government activities. The Estonian government has paperless 'e-cabinet' meetings where government cabinet members can examine documents and cast votes via computer. Estonia's projects have largely been a success, with mobile, fixed and Internet penetration rates as high as other leading European economies (OECD *Regulatory Reform* 21).

With the need for technical literacy and broad education established as a prerequisite to computerization, just what kind of 'appropriate education' should one strive for, if relevant distributive justice is the goal? In education, are skills training enough or must one be trained for full empowerment in the new social order?

This debate rages today much as it did in the late nineteenth and early twentieth centuries in America. The debate between the Booker T. Washington and W. E. B. DuBois schools epitomizes the conflicting opinions. Booker T. Washington, author of Up From Slavery and former President of Tuskegee Institute, faced the dilemma while aiding ex-slaves in making the transition to a producer-consumer society; one in which blacks had to pay their own way in a foreign economic system.[31] He urged strong vocational education in agriculture and the skilled

[31] Booker T. Washington based all his hopes for himself, his students, and his people on the civility between blacks and whites. In a time of little cheer, and less choice, he tried to return good for ill and vowed, "I will allow no man to drag me down so low as to make me hate him." He also had a different outlook on success, "I have learned that success is to be measured not so much by the position that one reaches in life as by the obstacles which he has overcome while trying to succeed." And if he truly believed this, he surely had enough obstacles to overcome. He made the long journey from slave cabin to Hall of Fame, from sleeping outdoors to enrolling at Hampton Institute, to dining with President Roosevelt.

Washington was the driving force behind Tuskegee and his personal philosophies were stamped on the school from its founding. At Tuskegee learning and doing were linked from the beginning. Teachers and students made the bricks that built their labs and libraries, stuffed the mattresses they slept on, and they raised the food they ate. Washington said, "Onward and upward", but he did not say how far or how fast.

trades at the expense, if necessary, of a broad based education (Washington 131-158). Largely seen by today's blacks as conciliatory to whites, Washington's arguments deserve further examination and updating as we make the transition to a new global economy in which India is experiencing rapid growth in the ICT services sector and Asia has experienced two decades of growth as a assembler and manufacturer of ICT products.

It was Washington's 1895 speech before the Cotton States and International Exposition, called the" Atlanta Compromise," that caused the most furor among blacks. He asked white Southerners to abide by the law and to aid in the education of blacks. He asked blacks to postpone their fight for political power and social justice until they gained more prosperity. His argument was based on the hope that, if whites were not pressed, their growing admiration for the achievements of blacks would lead them to grant blacks the place in society which they had earned (Washington 131-158).

Others did not share his hopeful view of whites. Dr. W. E. B. DuBois, the Harvard educated black professor who later served as an editorial voice for the NAACP, wrote that Washington had given up three things essential to black improvement: the vote, social equality, and liberal education. DuBois believed that success meant more than monetary gains. He accused Washington of preaching the 'Gospel of Work and Money' to the extent of overshadowing the higher aims of life. He also blasted Washington for accepting the alleged inferiority of blacks. DuBois eloquently states in his, Souls of Black Folk, that "manly self-respect is worth more than lands and houses, and that a people who voluntarily surrender such respect, or cease striving for it, are not worth civilizing." Further stating, "Is it possible, and probable, that nine millions of men [blacks] can make effective progress in economic lines if they are deprived of political rights, made a servile caste, and allowed only the most meager chance for developing their exceptional men?" DuBois set the stage for a great disagreement over methods of reaching the same goal -- compromise vs. confrontation (DuBois 42-88).

Just as DuBois believed in first a rigorous training of the mind in various academic disciplines and then training in a specific trade for breadwinning, today many educators and scholars are advocating back to basics plus a strong sprinkling of the classics. Just as Washington believed in training for survival first, then training in the arts and letters "as intelligence and wealth demand," business leaders today argue that schools are not preparing students for the job market. Who is right? There are no clear answers but consider the dilemma. The global economy must have thinking beings, yet our technology-based society demands marketable, quantifiable skills for survival. Perhaps both men are correct.

The answer lies not in decisions requiring *either* academics *or* trades, but *both* scholars *and* inventors, global vision *and* local action, entrepreneurs *and* skilled workers. The greatest need today is for creative, technically literate people who can think through problems, communicate them succinctly, and get results with minimal non-renewable resources. We need people who are generalist in all things and specialists in a few.

Our educational process is designed to accommodate the needs of an industrial society and it is becoming increasingly obsolete as the industrial society becomes more obsolete.[i] So, business leaders are correct. We aren't training students for today's high-tech business world. The scholars indeed are also correct. We have spent too much time teaching vocations and not enough teaching the arts and letters. Students may be able to get jobs but they can't think independently or creatively. And so the DuBois -Washington debate rages.

What is an appropriate education today? Software developers certainly need an in-depth technical education but most of the population will be computer users. The ability to use computers comfortably is the key to being functional in an information society. If one looks at those professions which regularly use computers to do their work, but which don't consider computer science as part of their specialty, two things become apparent, according to Vico Henriques. First, people working with computers have the confidence that it is just another tool to help them perform their jobs. They use computers as a secondary tool, just as they use telephones, calculators, or typewriters. The second is that people who work with computers are articulate and literate. Such diverse professionals as lawyers, engineers, librarians, medical professionals, and Indian call center operators all use the computer with equal facility, not because their academic training is similar, but because their basic communications skills are well developed.

Our schools do not have to turn each student into an engineer. Rather, students should be taught how to understand and use the computer to accomplish their own ends. [ii] Whatever their subject, they should acquire skills to know how to retrieve and collect information or how to hook up with storehouses of data in various parts of the world. Crucial preparation must include the ability to read, comprehend, and articulate various languages. Equally important are sound mathematical skills as well as basic understanding of symbolic languages or references, which easily derive from traditional disciplines such as map reading.

We will not throw off technology. Rather, as disadvantaged communities embrace technology, they will need to incorporate the best of technology with the best of philosophy. They need to train their minds and those of their children, to use both the discrete and the intuitive capabilities of the brain. Therefore we will view the world according to the holistic or systems theories being advocated by futurists such as Marilyn Ferguson --"View the problem in its entirety, including its context, then use rational and intuitive approaches to derive a solution" (Ferguson 48). Then, and only then, should computer-based technology be used to enhance and extend the learning experience and the flow of productive work.

In economic development, is it adequate to provide an opportunity for a job in the digital economy, or must one be given the ability to produce? According to a report from the Institute for the Future (IFTF), "Technologists are already among the highest paid workers in India, for example, and officials expect the total number of local software developers in India to grow to 1.3 million in four years from 400,000 in 2002. This would make India home to more software programmers than any other country. Exports of software and services in 2000-2001 were $8.3 billion up from $5.7 billion the previous year" (IFTF 144). The outsourcing of software development and services to India means that, in the words of Tom Friedman, "The playing field is being flattened." During a recent trip to India, Friedman noted how, "Indian entrepreneurs wanted to prepare my taxes from Bangalore, read my X-rays from Bangalore, trace my luggage from Bangalore, and write my software from Bangalore." "Countries like India are now able to compete equally for global knowledge work as never before – and America better get ready for this," observes Friedman.

In addition to the questionable benefits of ICT access to poor communities, a strategic question is raised when these poor communities seek to go beyond consumption of ICT into the expensive proposition of research and development involved in ICT production. Therefore, critics of ICT ask if it ethical for poor countries to invest in pure ICT R&D, given its lack of short-term tangible benefits? Was the formation of the Indian Institute of Technology in the 1950s, what is now fueling India's IT boom, strategically and ethically correct or is this likely an exception that should not be repeated by other poor countries?

To African-Americans this argument of subservient work by Indians to colonial British masters versus full empowerment for a highly-educated Indian leadership harkens back to a debate within black America between W.E.B. DuBois and Booker T. Washington.[32] In modern times, one might look at debates between those who propose vocational and technical education

[32] To understand the schism of views between DuBois and Washington requires a brief review of the times in which they lived. Washington's lifetime spanned the period from the Civil War to World War I, from 1856 to 1915. DuBois was born in 1868 and died in Accra, Ghana in 1963. DuBois saw America go through two world wars, an Asian "Conflict" and drastic social changes. It was an era of unparalleled material growth and change during which the United States emerged as the leading industrial nation in the world. As Emma Thornbrough explains, "It was the age of 'big business' in which men like Rockerfeller and Carnegie were free to exercise their entrepreneurial and acquisitive talents without interference from government." It was also the age of Social Darwinism, which proclaimed the right to unrestrained competition as indispensable to economic and social progress, the age that saw the rise in union power as European immigrants poured into the surging economy. Black Freedmen and ex-slaves alike saw an increasingly hostile America, which attacked their civil and political rights in both the North and the South. Educating blacks was at the discretion of philanthropists and uncaring and ill-financed local school boards (Thornbrough). It was a time when both Washington and W.E.B. DuBois realized that if blacks were to get any sort of education at all, it would unfortunately depend upon handouts from whites. Their debate, however, centered on the manner and emphasis of education.

versus those who demand enlightened liberally educated leadership to 'look out for the best interests' of the masses.[33]

Washington's compromise, and its underlying assumptions of white civility, seems to have been his serious major flaw. Mr. Washington ignored the main reason for blacks' existence in this country -- servitude. As John Henrik Clarke and the other contributors to The Black Manifesto For Education point out, "Black people were not brought to this country to be given education, citizenship, or democracy; they were brought to this country to serve, to labor, and to obey" (Haskins 17). When servants were educated at all they were educated to serve.[34]

This is the kind of harsh reality that Booker Washington ignored.[35] This is the danger that DuBois saw inherent in the racism of American capitalism. In more recent times attitudes have not seemed to progress. Dr. Clarke sees the modern urban ghetto as America's slave quarters, and black unemployment seems to be a conscious effort at maintaining a reserve supply of labor for surge markets. Based upon this and the all too frequent apathy of the white (and black) middle class who do not want to improve significantly the condition of the poor because it would jeopardize their own status in American society, as Shostak and Gomberg found in their 1965 study, New Perspectives on Poverty, the situation remains pessimistic.

This rampant attitude of American one-upmanship and competitiveness necessitates underserved communities to cling to the DuBois school of political activism in an effort to hold on to their meager little rights and property. Mr. Washington's other fatal philosophical flaw is actually a strategic economic mistake. Washington, from the Ben Franklin school of hard work, Puritan ethics and craftsmanship, advocated skilled training in the crafts and agriculture. This may have made sense during Franklin's day, but Washington's America was industrializing at a fierce pace. He was unwittingly training black youth for obsolescence. The skilled trades were being replaced by the technology of mass production and the manual labor of the farm was being mechanized with tractors, reducing the need for farmers and craftsmen. He failed to change with progress and

[33] Washington, striving to transform Negroes into middle class Americans, was willing to pay too high a price for entry into the mainstream. He looked on black freedom and America's economy as privileges, whereas DuBois saw them as rights that were worth a fight if necessary. Both men had more in common than we have been led to believe. For example, both sought to prevent racist laws from being passed. The two leaders pointed out Negro "weaknesses" and exhorted the race to transform itself morally and become more thrifty and industrious. Both favored a form of Black Nationalism and racial self-sufficiency, although Washington's system was not only domestic but also rural and Southern, while DuBois' stressed Pan-Negroism, encompassing not only the United States but also Africa and the West Indies. Stressing suffrage for 'literate men,' Washington wanted preparation and evolution, whereas DuBois sought immediate voting and revolution. While DuBois disavowed useless complaints, he seemed to hold blacks less responsible for their condition than did Washington (Rudwick).

[34] This is the trap into which Washington fell. He really believed that the Constitution was also written for blacks. It was not. Thomas Dixon, writing in reply to Washington's Atlanta speech, told of the general sentiment of whites during that era.

> "The Civil War abolished chattel slavery. It did not settle the Negro problem. It settled the Union question and created the Negro problem. It [Washington's plan] will only intensify that problem's danger features. I have for the Negro race only pity and sympathy. He has never had opportunity in America, either North or South, and he never can have it. This conviction is based on a few big fundamental facts, which no pooh-poohing, ostrich-dodging, weak-minded philanthropy or political can obscure. No amount of education of any kind, industrial, classical, or religious, can make a Negro a white man. The greatest calamity which could possible befall our Republic would be the corruption of our normal character by the assimilation of the Negro race. I have never seen any white man with any brains who disputes this fact. Mr. Washington is not training his students to be servants at the beck and call of any white man. He is training them to be independent and to destroy the last vestige of dependence on the white man for anything. The Negro remains on this continent for one reason only. The Southern white man needed his labor, but when he refuses to work for the white man then what? Competition is war -- the most fierce and brutal of all its forms. The white Southerner will do exactly what his neighbor in the North will do -- kill him! The point I raise is that education necessarily drives the races further apart, and Mr. Washington's brand of education makes the gulf between them, if anything, a little deeper (Thornbrough).

[35] Washington's education for passivity is in direct contrast with the reality of the challenge. Kwame Toure' (Stokely Carmichael) noted, back in his 1966 speeches, that blacks need money, education and influence through powerful people. All three are needed; abrogation of one dilutes the power of the other two. W. E. B. DuBois would certainly concur. Kwame Toure' did not see education as the panacea, though essential; he saw that the masses must obtain the power to make (or participate in making) the decisions which govern their destinies (Carmichael 10).

unfortunately his graduates still had to struggle blindly through yet another foreign economic system.

As the global economy moves from industrial to information-based, it is instructive to look at the DuBois-Washington schism in the context of a modern success. Consider the lessons from India's post-colonial technology public policy decisions. Jeffrey Sachs, a Columbia University economist and advisor to the UN Secretary General, Kofi Annan, explains that the common wisdom that rich countries should perform the research while poor countries focused only on raising their basic education and literacy levels is now invalid. Sachs explains that, the Indian Institute of Technology, formed in the 1950s and 1960s, used its rarified educational programs to produce a generation of computer scientists and engineers that is now fueling India's IT boom. More importantly, Sachs observed, "…they also created teams of scientists able to harness that technology specifically to meet India's needs" (Sachs, <u>End of Poverty</u> 258).

An important parallel also exists between the Indian and Chinese entrepreneurs and DuBois' 'Talented Tenth.' According to the Silicon Valley-based Institute for the Future, known as IFTF, India and China have provided significant sources of talent and innovation in the global technology infrastructure, much of it through significant expatriate communities. The IFTF report cites the work of Anna Lee Saxenian, a researcher at the University of California, Berkeley, who has studied the global impact of technology workers in Silicon Valley. She found that Indian and Chinese technology workers don't just leave their countries behind when they come to America.

> "In a series of surveys, Saxenian found that these foreign-born professionals often had strong links to their native countries. Indeed, over half the respondents who were running start-up companies in the Valley also had set up subsidiaries, joint ventures, subcontracting, or other business operations at home. Her research found that three-quarters of Silicon Valley's Indian and Chinese immigrant professionals said that they would consider starting businesses in their native countries in the future. The combination of the dot-com boom and bust in the Western economies and rapid economic growth and change in China and India have resulted in a significant return of talent to China and India. Returnees acculturated in an environment of entrepreneurship and capitalism are applying their skills and experiences in their home countries. With the opening of the economies in these two countries, the returnees are poised to make China and India a greater part of the global economy in the 21st century" (IFTF 144).

This is exactly what W.E.B Dubois proposed for a cadre of educated Negroes at the turn of the twentieth century. DuBois extolled powerfully perceptive points. College educated blacks could have been the salvation of black racial and social leadership. Ethnic dualism, where blacks participate fully in the American society while having a clearly defined detached destiny, is still possible and is the strategy many successful expatriate Indian and Asian entrepreneurs have used. Making America more like a stew, where meat, carrots, potatoes, and peas are essential for the total substance of the stew, yet each retains its characteristic appearance and flavor, seems to be more desirable than an homogenous 'melting pot.' More than any other point, DuBois was extremely perceptive when he preached that the preservation of rights was inseparable from political activism. DuBois was basically telling us that acquiring land, homes and money means nothing if tomorrow we could lose them through political ineptness and unjust laws.

While computers can be tools for economic advantage, merely acquiring a computer is as useless as gaining union membership in an industry that has moved offshore. As one can see from the Indian example, access to the tool is useful only to those prepared to use it. Washington could prepare ex-slaves for skilled trades, but skills are of value when relevant goals can be accomplished. In today's information economy, computers and Internet access are required, but are insufficient for socio-economic advancement.

Chapter Seven

Conclusions

The paradigm of the global economy puts a huge premium on education, skills, and access to information technology. People will not be denied access. We should stop denying that there is in many places an increase in inequality, and we should instead start explaining why it has happened and what we can do about it.

-- President Bill Clinton
Speech at the 2000 World Economic Forum,
Davos Switzerland

The McGinn framework for applying ethics-based utilitarian principles of Distributive Justice in the analysis of various stakeholder positions regarding controversial technologies has proven useful in determining the fundamental issue of the 'digital divide.' Rather than being a magic prescription that allows undereducated, underdeveloped, and underserved segments of our global citizenry to leap into the information economy from their industrial or agricultural roots, the 'digital divide' has much more mundane, yet stubborn, roots in social inequalities, including basic healthcare, literacy, living conditions, equitable status of women and minority groups, and hope.

The bleak reality of the global market that ICT proponents seeks to influence is that 1.2 billion people live on less than one US dollar per day (Serageldin 54-58). In the context of the lives of the poor, an argument can be made that the digital divide, and its implied access to computer-based information, is irrelevant to the substantive life and death issues of the vast majority of the poor. As one can see from the Indian example, access to the tool is useful only to those prepared to use it. Sachs notes that, "The evidence shows clearly that India's economic growth was urban led, with the gaps in living standards between the cities and the countryside widening in recent years" (Sachs, End of Poverty, 184). Though India has a middle class of over 300 million people, a bustling urban economy increasingly participating in global markets, and a technology sector that rivals Silicon Valley, 700 million people are left behind. As Lalita Law, the principal of an experimental school for 'untouchables' in Baliganapalli, south of Bangalore, explained:

> This 'India Shining Thing' irritates people like us. You have to come to the rural villages to see whether India is shining. India is shining okay for the glossy magazines, but if you go outside Bangalore you will see everything about India shinning is refuted. Alcoholism is rife and female infanticide and crime are rising. You have to bribe to get electricity, water; you have to bribe the tax assessor to assess your home correctly. All they [the villagers] see is gloom and darkness and despair. The only 'mouse' these kids have ever encountered is not one that rests next to a computer, but the real thing (Friedman, World 176-177).

While the digital divide is a very significant problem in developing economies, recent data from a 2005 OECD report show that people around the world have much better access to ICTs than they did even 10 years ago, with the largest improvements in middle-income countries. This has been possible with advances in technology and regulatory reform. However, just as the connectivity for a certain technology improves across income levels, a new technology, such as broadband, appears and it leaves populations in developing countries and in disadvantaged segments of developed economies continually 'playing catch-up' (OECD *Regulatory Reform* 9).

As the 2005 OECD report notes, high-speed international ICT infrastructure is becoming more accessible in developing economies, including those in Africa, Latin America, and Asia. The combination of decreasing costs of ICT, Open Source software, recycled computers, and entrepreneurial interests is making technology available on a broad scale. This enables the initial steps toward closing the entrepreneurial and educational ‘digital divide’ in countries such as Rwanda, South Africa, Brazil, and Guatemala. However, those taking advantage of ICT access are those who are literate and trained, and those to whom the use of ICT is relevant. The LaGrange, Georgia experiment shows that even when access is delivered for free to the home, it is insufficient to adequately address the ‘digital divide.’ While the Free Internet Initiative produced some limited success, public policy makers in LaGrange found that it was difficult to motivate the majority of the target households to adopt the system, and it was most difficult to do so in the poorest communities (McFarland).

Though the ‘access divide’ is closing, the ‘structural digital divide’ is widening. Even if a country has a high level of access to ICT, it may conceal considerable inequity within the population, adding the wealth factor to the digital divide debate. The biggest divide between blacks and whites in the US is economic status, nearly 20 percent worse than any other category in the Urban League’s report. Although slight improvements are noted, the equality gap is getting worse in unemployment, building wealth and savings, reversing many of the employment and income gains made in the 1990’s. The widening socio-economic gap is due to a major technology-enabled shift in the nature of education, work, and governance on a scale equal to other great technology-enabled revolutions. Therefore, distributive justice is no longer just about access to computers; it concerns the distribution of social benefits and burdens relevant to the long-term well-being society.

Technology cannot solve the problems of school funding, institutional racism, of teachers who may not truly believe in the innate learning ability of all children, of parents who may not stress the value of education, a lack of self esteem, family or community problems, or lack of motivation by the student. Computers cannot be a substitute for human contact, role models, encouragement, and love.

As the World Bank warns, governments cannot rely on the power of markets alone to address the ‘digital divide’. Distance and the low income of rural communities limit their appeal to private sector operators. Countries invest in interstate highways, electric power grids, network television, and national newspapers; in the same way, the new education system requires investment. However, those educational investments should not be simplified into the tangible artifacts of computers and networks alone; human capital development has to be the goal of education. As the United Nations warns, ICT does not stand alone. The impact for human resources development comes from integration into other efforts, with adequate financing and skills from various quarters (UN 1).

Sachs stresses that technology has been the main force behind the long-term increases in income in the rich world, not exploitation of the poor.

> Many people assume that the rich have gotten rich because the poor have gotten poor. Let me dispose of one idea right from the start. This is not to say that the rich are innocent of the charge of having exploited the poor. They surely have, and the poor countries continue to suffer as a result in countless ways, including chronic political instability. Every region of the world experienced some economic growth, but some regions experienced much more growth than others. The key fact of modern times is not the transfer of income from one region to another, by force or otherwise, but rather the overall increase in world income, but at a different rate in different regions (Sachs, End of Poverty 31).

Sachs suggests that the entire world, including today’s laggard regions has a reasonable hope of reaping the benefits of technological advancement. “Economic development is not a zero-sum game in which the winnings of some are inevitably mirrored by the losses of others. This game is one that everybody can win” (Sachs, End of Poverty 31).

However, even in the face of Sachs’ optimistic view of technology’s potential, technological change accounts for most of the workers displaced from their jobs each year (Griswold 1). At the same time, it is technology that opens the door to new economic opportunity.

So, regardless of how low one stands on the economic ladder ICT technology cannot be ignored and, as a matter of distributive justice, people cannot be denied access to it.

Every technology has its detractors, but one cannot let fear dash humanity's dreams. José Ortega y Gasset reminded us that, "Man begins where technology begins. The mission of technology consists in releasing man for the task of being himself" [iii] (117-118). Being oneself is not always attractive. As an amplifier of human capabilities, Information & Communications Technologies are tools to help implement our social program.[36] As a tool, ICT can amplify a poorly thought out program as well as a brilliant one. Since tools have no abilities on their own, the intended or unintended consequences of the human program are our collective responsibility.[37] Therefore, the inequities of opportunity created by the skewed distribution of ICT toward the rich, powerful, and white, are not just a function of the price and availability of technology, nor access to that technology. Those inequities existed as social problems before modern ICT's development; ICT exacerbates the differences between 'haves' and 'have nots' with regard to economic opportunity, educational attainment, and participatory democracy.

Much of the relevance of science to society arises by way of technology. Technology is how we do things, not how we think of them. To this extent, technology is not neutral. Historically, technology has been, and continues to be, driven by the underlying cultural values of society. Those values have been derived from the worldview of a society, which includes the dominant philosophical paradigms of what is known (science), what is believed (religion), and what is desired (self-interest). Neither science, religion, nor self-interest is unbiased and they certainly actualize in the real geo-political economy as non-neutral and often unfair.

Technologies are concrete manifestations of a culture's worldview, because it is technology that is explicitly targeted at a certain set of aims. As the science writer Robert Pool would state it, "One must look past the technology to the broader 'sociotechnical system' -- the social, political, economic, and institutional environments in which the technology develops and operates. Modern technology is not simply the rational product of scientists and engineers that it is often advertised to be. Look closely at any technology, from aircraft to the Internet, you'll find that it truly makes sense only when seen as part of a society in which it grew up" (Pool 5-9).

Since today's scientific and technological initiatives are driven by social values, it is instructive to explore the cultural values that twenty-first century Western global capitalist societies embrace and their subsequent effects on how the public is becoming increasingly skeptical of the unintentional consequences of unfettered science and technology. ICT is the child of a Silicon Valley that seems to have a habit of reducing causes and cures to pure mechanistic explanations. Silicon Valley's assignment of an omnipotent role to science, of solving all problems and clarifying all things, and of deifying nature can lead science to what Robert Fischer refers to as, "…like other ideologies, [science] tends to be systematic, authoritarian, and to be held tenaciously" (Fischer 68).

Science and technology cannot ever hope to realistically answer the big questions facing humanity. Being based upon observation and testing, science is at an impasse when it comes to things that cannot be observed, measured, tested, and predicted. Social problems transcend mathematical description and involve emotions that cannot be touched, measured, or manipulated successfully. Worse still, technical solutions often only address changes in technique

[36] Ortega advised that, "Man's existence is no passive being in the world; it is an unending struggle to accommodate himself in it. Man has to be himself in spite of unfavorable circumstances; that means he has to make his own existence at every single moment. Man must earn his life, not only economically but metaphysically" (111). "Man, in existing has to make his existence. He has to solve the practical problem of transferring into reality the program that is himself" (115). As Ortega would argue, "In the very root of his essence man finds himself called upon to be an engineer. Human life 'is' production. By this I mean to say that fundamentally life is not, as has been believed for so many centuries, contemplation, thinking, theory, but action. It is fabrication; and it is thinking, theory, science only because these are needed for autofabrication, hence secondarily, not primarily" (116). Therefore, "Technology is a function of the variable program of man" (124).

[37] According to André Leroi-Gourhan (1911-1986), the body social forms the prolongation of the anatomical body. There is a balance between the body social and the individual's 'indefinitely perfectible extension in action' and the extension of paleontological trajectory (20). This trajectory, from a social evolution perspective, is inherently a function of values. As Leroi-Gourhan would state it, those sets of values give every human group a personality, unique at each moment in history (20). Therefore, technology has been driven by society since the earliest of recorded history.

that might relieve the symptoms, but do not demand changes in human values or morality, which ultimately affect many underlying causes (Meadows 155-159).

To the degree that human capital development in the form of economic opportunity, educational attainment, and participatory democracy are constrained to an elite few, this is a social problem rather than a technical one.[38] So, Anthony Wilhelm's contention is correct. The great challenge of the twenty-first century 'digital divide' is not a technological problem, but rather a social one, where the global society must come to terms with our diversity (Wilhelm 125). It is about human capital development, rather than technology acquisition and Internet access, per se.

The superficial argument of equitable distribution of computers, communications lines, databases, and software programming masks the complexity of this social problem. The digital divide is a struggle for relevant distributive justice applied to life and death priorities, such as disease, poverty, and illiteracy, and access to the infrastructure for public goods, services, and wealth. This social evolution is occurring in a rapidly transforming information economy that is intertwined with historical issues of race and class. Therefore, the 'real' digital divide is not about the just distribution of computers. It is about the just distribution of opportunity for economic and social development in a technological society. John Stuart Mill's ethics of Distributive Justice and John Rawls' Difference Principle need to be re-examined and redefined in an era of technologically-enabled global socio-economic restructuring. In addition, the Difference Principle requires that solutions to the digital divide also consider the moral application of new technologies in a manner that provides the most benefits to those most negatively affected by it.

Many people try to conveniently ignore the plight of the masses of humanity, as if their poverty and ignorance will never affect the rest of us. For example, Garret Hardin, in Lifeboat Ethics, maintains that we have a duty not to help the poor and starving of other countries because they will overrun the lifeboat and sink us all. This short-sightedness assumes that we live in isolation and presumes that the fates of those in the lifeboat are independent of the fate of those in the water. Others claim that aid does not work, that bureaucracies tend to perpetuate themselves at the expense of the poor, and that aid creates an unhealthy dependence, in the manner described in the Biblical parable of teaching the poor to fish rather than giving them fish. We ignore these people at our own peril. According to Farmer, "Complex social webs not only link the city and countryside but also link one country to another" (Farmer 277).

Perpetuating the various social divides in an era of intensive technology expansion of the global economy, knowledge, and effective political participation only exacerbates the dire problems of the poor. To restate the Biblical parable, we are giving them fish, rather than teaching them how to fish. It sentences the poor to permanent subsistence status, or at best, to a permanent servile caste. Likewise, an updated perspective of Rawls' Difference Principle charges technologists with the mandate to, not only protect the most vulnerable, but to distribute the benefits of ICT to those most at risk to any intentional or unintentional negative consequences of ICT.

The day is long gone when technologists could arguably claim to have no responsibility for how their innovations are used. As Ortega suggests, "We are not allowed to confine ourselves within our own professions, but must live in full view of the entire scene of life, which is always total. Alertness is what we require" (Ortega 103). It is hollow solace for computer scientists and engineers to assume that they have left their belief systems, prejudices, fears, needs for security, egos, friendships, and enemies at the door. Given that technology, and the engineering profession that practices it, is a function of these non-neutral drivers, the potential impact of technology on the well being of global society is, likewise, determined by our knowledge, beliefs, and desires. As a result of overt human goals and subjective human judgment, technology is never neutral because it is directed in specific instances toward specific material objects.

As new entrants join the 'Digirati' what ethical obligations do they take on as a technical professional, and especially as a member of the underserved communities?[39] They should ask

[38] Human capital development suggests an intrinsic notion of education in skills necessary to make mature informed judgments in a participatory democracy and the ability to bring capacities to the table that have value in the marketplace of ideas and goods (Wilhelm 45).

[39] 'Digirati' is a play on words taken from 'Literati' and commonly used during the height of the 1990s 'Dot Com' era by ICT proponents and industry professionals to describe themselves.

how utilitarian ethics can play a role in assuring that the raw commercial interests of ICT do not overshadow the overall public good. This paper addressed the need for a more ‘relevant utilitarian’ approach to domestic and global ICT infrastructure allocation that seeks to maximize the overall benefits to society while providing a fairer distribution of benefits and costs than is found in contemporary practice.

There is an adage within the African-American community that, “If anyone is to be negatively impacted by scientific research or new technology, it will be the poor, the powerless, and those of color.” Therefore, in the technologically intensive society of twenty-first century America, indeed in the global capitalist market as a whole, the public policy decisions involving the use of ICT and the investment of public funds, or the subsidization thereof, can have profound unintentional, or intentional consequences on the commons shared by all. The ICT community, as well as the individual engineer, must be vigilant in their efforts to recognize subjective bias and make adjustments for it.

Ian Barbour sees the danger, not in technology Therefore, but in uncritical preoccupation with technological goals and methods (Barbour 65). Some of the less enlightened engineers have fostered a gee-whiz attitude of applying technology either for technology's sake or for the short-term profits of employers. If this is true, Distributive Justice may play a role in assuring that the raw commercial interests of ICT do not overshadow the overall public good. The Difference Principle may also provide improved guidance to the technologists engaged in the development and dispersion of powerful ICTs in controversial public policy areas. Consider a few of the ways that information technology can get out of control and have either unintended or uncaring negative effects on those on the other side of the divide.

Due largely to Silicon Valley, we are in the midst of an economy that defines success by the ownership and control of information and the tools that access and exploit abstract representations of knowledge. However, the public is increasingly concerned that the benefits of ICT are being outweighed by our inability to control the negative consequences. Likewise, in the post September 11, 2001 world, we live with the terror of threats -- seen and unseen, actual and predictive – that allow certain political leaders to reduce our individual rights and enable business leaders to shelve their social responsibility in order to make a fast profit. Government initiatives to use data mining techniques to profile terrorists, corporate monitoring of employees’ computer use, and Internet commerce sites routinely capturing and selling personal preference information are merely a few of the similarities between America in 2004 and George Orwell’s Oceana of Nineteen Eighty-Four. We live in a culture that is quickly moving toward a paperless and faceless society. However, the faceless or non-human contact of the Information Age only enhances individual vulnerability.

The economy also requires identification numbers, credit records, medical, dental, educational, criminal, and family records to be stored, matched, updated, and archived by computers. Dependency upon databanks is not an indictment of those sources, per se. However, the ultimate threat to privacy and distortions of reality revolve around the use of our files by agencies to judge our creditworthiness, our insurability, our employability, educatability, and our desirability as neighbors or tenants. This creates an enormous potential risk to the privacy and accuracy of personal records in databases. Through maliciousness or accident one may become a perceived threat or at least an undesirable.

Consider as well how the ICT industry’s well-intentioned cost savings can be corrupted by a blind allegiance to raw capitalism. The case of *differential pricing* is illustrative. Is it fair to have different pricing of the same service, especially if such schemes disadvantage those who are already economically or educationally disadvantaged? For example, electronic banking has moved from a convenience to the standard way consumer banking is done. Indeed banks often charge higher fees for using tellers, or even ATMs, and lower or no fees for using online banking. Without access and basic computer skills, one’s whole life in twenty-first century America costs more. From comparison-shopping, to discounted airline fares, to looking up a phone number or an address, companies charge more for the non-use of Internet-based information sources. In a September 2004 study by market research firm OMD, on behalf of Yahoo (making it an admittedly skewed sampling of respondents), 75 percent of the respondents agreed that the

Internet gave them an advantage over those who did not have it, including lower prices, quicker service, and more convenience.

Consider, as well, the example of how raw monopoly power of one's employer can compromise the ethical diffusion of innovation's benefits. Is it ethical to subsume the public interest in a new competitive technology, such as Voice-Over-IP (VOIP) or wireless Internet access, in favor of one's employer who has a monopoly on the traditional telephone infrastructure? Such cases happened when the city of Philadelphia wanted to make wireless access available to the public and when Madison River Telecom blocked the ability for its subscribers to use VOIP, according to Lawrence Lessig of the Stanford Law School at the *Open Source Business Conference* in April 2005.

Is it enough to provide the twenty-first century equivalent of the civil rights won in the 1950s and 1960s, e.g., the vote, nondiscrimination in public services, equal access to education, nondiscrimination in employment, or must one be made a fully capable player in participatory democracy and the global economy?

The G-8 Dot Force stressed the role of *eGovernment* and *eGovernance*. As Cheryl Brown reports, “It recommended that countries' strategies acknowledge the significance of eGovernment for efficient and effective government and the importance of eGovernance for building institutions, achieving transparency and accountability, and enhancing democratic governance.” eGovernment among a population that is familiar and competent with ICT may draw more of the citizenry into the decision-making of the democratic process, thereby making for a society more at ease with itself, notes Edwyn James of CERI. When it comes to government provision of services, such as addressing HIV/AIDS and other health issues or to enhance digital opportunities, the Dot Force advised the promotion of ICT in health education, healthcare delivery, awareness campaigns, knowledge sharing, and research. It also advised governments to provide online content and state-owned information that is not classified or private (Brown 4-5).

When it comes to eGovernment, plans often emphasize the use of the Internet, personal computers, and public kiosks as tools of ICTs. However, regions of some countries heavily rely on or benefit from fax machines, public phones, CB radios, or mobile phones. Also, well-intentioned government programs to utilize ICT to provide services can miss their target audience. For example, an Alabama program offered by the state employment agency encouraged jobless citizens to use a regional ‘one-stop' center that offered training, job listings, and other employment assistance. However, billboards erected in the poorest part of the state only listed the website address as contact information (Wilhelm 73). Consider as well how the US Secretary of Agriculture, Ann Veneman, launched a program in 2003 to fight hunger, but it used an online prescreening tool to determine Food Stamp eligibility (Wilhelm 73). It is ironic, insensitive, and arrogant for the government to be unaware that most Food Stamp recipients are not online.

Brown also found that citizens in developing countries might mistrust governments to provide accurate information and they might be afraid of how governments could use the information against them. In addition, public employees may be threatened by new ICT technology and resist its implementation. “Public employees may be especially threatened by online services replacing their job responsibilities. To be sure, this trust factor exists in technology-rich nations that have implemented extensive e-government policies. In developing countries with a dominant public sector, however, public employees find themselves in the midst of rising unemployment, new skill requirements, declining job security and benefits in a shift to privatization or private-public cooperation likely to occur with the emergence of pro-competitive information and telecommunications” (Brown 9).

If electronic voting becomes the norm, how can society, not only be sure of the technology's security and integrity, but how can such a ICT be rolled out without excluding those without access to such systems? What was meant to be a convenience and a means to reach more voters could place at risk the participatory democracy of those without access to computers and the Internet. Consider the example of how in March 2000, the Arizona Democratic Party hosted the first binding online vote. Registered Democrats were given four days to vote in the election by computer, but only one day at polling places. Their promises to increase the participation in the electoral process may have had the unintended consequence of increasing the representation of white voters, since Latinos, Native Americans, and African-Americans who were underrepresented in the online population were given less opportunity to vote than their white counterparts[40] (Wlihelm 67-71).

The Association for Computing Machinery's (ACM) position is that, "While computer-based e-voting systems have the potential to improve the electoral process, such systems must embody careful engineering, strong safeguards, and rigorous testing in both their design and operation." With such a profound change in the daily lives of Americans, it is no wonder that the digital divide is a crucial matter of public policy.

Therefore, in the technologically intensive society of twenty-first century America, indeed in the global capitalist market as a whole, the public policy decisions involving the use of information and communications technologies and the investment of public funds, or the subsidization thereof, can significantly magnify unintended consequences. It also risks the social order of humankind by the maximalist tendencies of a relatively few wealthy elite at the expense of the bulk of the world's destitute citizens.

If this is true, one must ask what is the role of ethics in the actions of the technologists engaged in the development and dispersion of powerful information and communications technologies? Do engineers have a responsibility to society, and if so, what is that responsibility? Should technologists accept more responsibility for the implications of technologies on humanity? Those whose education or tastes have confined them to the humanities protest that engineers alone are to blame. Engineers say, with equal contempt, that humanists, politicians, and the 'commercializers' cannot wash their hands of blame because they have not done anything to help direct a society whose ills grow worse from, not only error, but also inaction (Bronowski 5). As scientist and philosopher Jacob Bronowski points out, there is no comfort in such bickering. Neither solves the problem. Bronowski states:

> There is no more threatening and no more degrading doctrine than the fancy that somehow we may shelve the responsibility for making decisions of our society by passing it to a few scientists armored with a special magic. For indeed, …it should make us shiver whenever we hear a man of sensibility dismiss science as someone else's concern (6).

This debate around the role of scientists and engineers as ethical social agents has been around for ages. Nearly fifty years ago, Bronowski reinforced the basic argument that scientists have a responsibility to humanity. Bronowski stated that the dilemma of today [1956] is not that human values could not control a mechanical science. It was the opposite: "The scientific spirit is more human than the machinery of governments." He saw scientists as belonging to a community that fosters free critical thinking and tolerance. Although he believed that the facts produced by science are neutral, science as a human activity is not neutral. With this established, he advocated a role for scientists as educators of the public on the positives and negatives of new discoveries. Bronowski shunned the idea of scientists as governors and plead for an adoption of the scientific ethic by world leaders[41] (Bronowski 71).

The responsibility of engineers and scientists as leaders on technology policy is somewhat like DuBois' concept of the 'Talented Tenth' who would lead the disadvantaged Negroes of the early twentieth century from the agrarian to the industrial economy, with enlightened public service as their guiding principle.

Likewise, twenty years ago, Mount Holyoke College Professor Anna J. Harrison presented an interesting case for the expert scientific consultant and against the expert scientific witness in technology decision-making. As the President of the American Association for the Advancement of Science, Harrison viewed scientific experts as, by definition, biased and

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[40] Non-Hispanic whites make up 69 percent of the Arizona population, but make up 85 percent of the adult Internet users in the state. Hispanics make up 21 percent of the population, but 10 percent of the home Internet users. Native Americans make up 6 percent of the population and 1 percent of the Arizona Internet users (Wilhelm 70).

[41] The late Dr. Bronowski eloquently and logically argued his points. He showed us that scientists are as fully human as artists and, Therefore, they display a full range of creative genius. Being human, however, means that scientists can no more shirk their responsibility to improve our lot than politicians. His argument, that scientists have a crucial responsibility (for which they are uniquely trained) to make the public fully aware of the implications of their work, should serve to bring the 'overly tunnel-visioned' researcher back into the realm of political activist and citizen.

therefore advocated a restriction of their role to that of consultant. This consultant role was consistent with Harrison's belief that, since technology necessarily involved a negative impact regardless of its positive impact, should be governed by an enlightened public. She stated, "My experience has been that, in endeavoring to communicate relevant scientific knowledge to individuals who have limited backgrounds in science, these individuals can comprehend the information very quickly if they understand the nature of scientific knowledge" (123). From this perspective, Harrison saw the role of scientists as educators of the public and as consultants to special interest groups. In a fashion similar to Bronowski's argument, Harrison once again stressed the importance of scientists coming out of their labs to participate in the decision-making processes of technical innovation by helping the public decide on socially appropriate courses of action.

Do engineers as a group and as individuals have special responsibilities as citizens, which go beyond those of non-engineer citizens? "All citizens have an obligation to devote some of their time and energies to public policy matters. Minimal requirements for everyone are to stay informed about issues that can be voted on, while stronger obligations arise for those who by professional background are well grounded in specific issues as well as for those who have the time to train themselves as public advocates," as put forth by philosopher Mike Martin and engineer Roland Schizinger (Martin 29l).

In 1984, Joel Yellin, then Senior Research Scientist at the Massachusetts Institute of Technology, proposed a system of expert advisors who would help create a deeper emphasis on the principle of public participation in technological decisions. Yellin saw the growing use of experts in government agencies and the delegation of public responsibility to these agency experts as being a serious threat to representative government. In an argument similar to his contemporary, Anna Harrison, Yellin conceded that administrators of agencies such as the Environmental Protection Agency (EPA) have far broader responsibilities than initially envisioned by politicians. They are called upon to assure worker health and safety, to protect and improve air and water quality, and to guarantee the safety of complex engineering systems. They also must predict the long-term consequences of major industrial and government decisions which, increasingly involve technological innovation that results in social changes which surpass the capacity of the general public to absorb these changes, not to mention understand all aspects of the technology. Yellin conceded the necessity for technical experts but warned of the dangers of the professional technocrat (Yellin 126).

His solution placed the scientist on a representative advisory board formed by the public with competence and the public interest as its chief operating rules. With Yellin, we saw yet another argument for responsible scientists participating in technical decisions rather than merely allowing the stated neutrality of science to cause an abandonment of this responsibility to professional bureaucrats.

Is there adequate support among the engineering community to encourage an active role by technologists in the decision-making processes regarding new information technology? As an example of the types of traditional codes of ethics, occasionally (and sometimes routinely) ignored by technologists, consider the following from twenty years ago:

- The National Society of Professional Engineers declares itself "to hold paramount the safety, health and welfare of the public" in the performance of their professional duties. (Martin 294).
- The Engineers' Council for Professional Development declares that engineers must "uphold and advance the integrity, honor, and dignity of the profession by using their knowledge and skill for the enhancement of human welfare" (Martin 300).
- The Institute of Electrical and Electronics Engineers declares that its members must "protect the safety, health and welfare of the public and speak out against abuses in these areas affecting the public interest (Martin 302).

So, we see that technologists should accept more responsibility for the implications of technologies on humanity. Their loyalty needs to be to humanity, not just to their employers or their governments. We have seen that their professions support this concept (at least verbally).

Is a significant re-evaluation of the ethics of distribution and the professional responsibility of computer scientists and software engineers called for? In more recent times the engineering profession has moved beyond the question of whether ethics applies to how ethics should apply to engineering decisions. Robert McGinn describes several ethical problems facing modern twenty-first century engineering practitioners. These problems include execution problems, such as unfair distribution of benefits and costs, the fear of whistle blowing, and lack of consideration of long-term effects. He also described communication problems, such as fraud and misrepresentation (McGinn, *Ethics* 18-26). The ethical issues go beyond prevention of government and business abuses, one must demand a higher standard of those who are carelessly irresponsible technologists. For example, Jeffrey Rosen's interview of Oracle executives indicated a profound lack of ownership of 'policy issues,' such as the balance between privacy and security. As Tim Hoechst, a senior vice president of Oracle, is quoted as stating, "At Oracle, we leave that to our customers to decide. We become a little stymied when we start talking about the 'should wes' and 'whys' and the 'hows,' because it's not our expertise" (Rosen 5-6).

Does the profession need a more "qualified utilitarian" approach to research and the allocation of technological developments in a manner that seeks to maximize the overall benefits to society while providing a fairer distribution of benefits and costs than is found in contemporary practice? Traditional professional society codes of ethics cite a series of actions and practices that professionals engineer or scientists should not engage in. It is a "thou shalt not" approach to ethics. Citing what one cannot do is tantamount to applying a deontological top's down approach to ethics. Most codes are so general that they rarely give the practitioner any tangible guidance as to how research and development should be performed and the deontological admonitions give the practitioner a mistaken belief that, perhaps, one can perform any task that is not explicitly prohibited. Since most codes are non-binding and only the most glaring of offences become publicly known, very little guidance is offered to the engineer who wants to work in the spirit of best practices.

To this end, McGinn has identified a series of *Fundamental Moral Responsibilities* (FMRE) that provide a much more concrete and proactive approach to engineering ethics (McGinn, *Moral Responsibilities* 6-19). Those FMREs include:

- FMRE1 – Not act in any way that one knows (or should have known) will harm (or pose an unreasonable risk of harming) the public interest.
- FMRE2 – To try to prevent (or prevent the repetition of) preventable harm (or the creation of an unreasonable risk of harm) from being done to the public interest.
- FMRE3 – Assure that all parties likely to bear non-trivial risks from one's engineering work are adequately informed about them upstream and given a realistic chance to give or withhold their consent to their subsequent imposition.
- FMRE4 – Work to the best of the engineer's ability to serve the legitimate business interests and objectives of the employer or client.

From these FMREs, there are certain *Derived Moral Responsibilities* (DMR) advocated by McGinn that include:

- Disclose to the employer or client any unrecognised options,
- Help the employer or client reach a clarified definition of problems originally presented to the engineer in distorted form,
- Ensure that all prerequisite conditions for the safe operation of a technology transferred from a more to a less developed society are satisfied,
- Be wary of paradigm overshooting as regards the use of analytical methods in innovative engineering contexts,
- Establish a precautionary organizational culture as regards the formal approval of integrity-related product changes,
- Assure in engineering work akin to social experimentation, that human subjects likely to be put at risk of harm are informed about those risks and given a meaningful opportunity to give or withhold consent to their imposition.

These moral responsibilities provide a paradigm shift away from merely cost reduction or harm reduction to a combination of maximization of benefits within the context of minimizing harm. From a quantitative analysis perspective, McGinn is proposing the optimization of two simultaneous equations (Anderson 350-352, 372-373):

- Maximax – Select the decision that maximizes the maximum payoff (do the most good for the most people).
- Minimax Regret – Minimize the maximum regret, or opportunity loss, associated with a decision (do no harm).

This is an improvement over traditional approaches that minimize harm (regret) or maximize profit (payoff), but rarely attempt to do both. In the case of ICT developers, this approach is also complementary to recent improvements adopted by the ACM[iv] and the IEEE.[v] The Ethics espoused by the ACM and the IEEE-CS Group[vi] reaffirm, not only the obligation of software engineers to do no harm, but they must also work in a positive, proactive, life-affirming fashion to the betterment of society. Excerpts from the ACMs ethics canons include:[42]

- Strive to achieve the highest quality, effectiveness, and dignity in both the process and products of professional work. Excellence is perhaps the most important obligation of a professional. The computing professional must strive to achieve quality and to be cognizant of the serious negative consequences that may result from poor quality in a system.
- Moderate the interests of the software engineer, the employer, the client and the users with the public good.
- Approve software only if they have a well-founded belief that it is safe, meets specifications, passes appropriate tests, and does not diminish quality of life, diminish privacy, or harm the environment. The ultimate effect of the work should be to the public good.
- When designing or implementing systems, computing professionals must attempt to ensure that the products of their efforts will be used in socially responsible ways, will meet social needs, and will avoid harmful effects to health and welfare.
- Computing professionals are obligated to protect the integrity of intellectual property. Even when software is not so protected, such violations (illegal copying) are contrary to professional behavior.
- It is the responsibility of professionals to maintain the privacy and integrity of data describing individuals. This includes taking precautions to ensure the accuracy of data, as well as protecting it from unauthorized access or accidental disclosure to inappropriate individuals. Furthermore, procedures must be established to allow individuals to review their records and correct inaccuracies.

By using an approach that proactively applies Distributive Justice and seeks to maximize the benefits for those most negatively affected by ICT, the engineering profession would be better equipped to address ethical dilemmas with confidence. But the tools alone are not sufficient. Personal commitment to the social and economic betterment of disadvantaged communities should also come from within those communities. It is in this manner that Dr. DuBois 'Talented Tenth' and recent lessons from Indian and Chinese entrepreneurs demand a second look.

Unlike their Indian and Chinese counterparts, too often the move of African-American 'Digirati' to the suburbs breaks linkages with the inner city black community. Rather than seeing the large pool of low-wage workers in the inner city as an untapped labor pool, African consumers and governments as markets, and low-cost manufacturing in Africa as an opportunity, the black middle and upper classes seem to strive toward full integration into the corporate American mainstream. They have not heeded the lessons of ethic entrepreneurial dualism so successfully lived by Indian and Chinese high-tech entrepreneurs.

As a result, blacks in America and Africa may also lose the opportunity to benefit from the creation of an indigenous technology that targets needs within the community and among members of the Diaspora. Looking to the lessons from India and China, Susannah Kirsch writing for the IFTF observes the following:

> For decades, most global markets have been defined by North American and European styles and values, for example, "newness," youth, individuality,

[42] See end notes complete versions of the ACM, IEE, and the Joint ACM/IEEE-CS ethics canons.

> and reliability. Japan, Korea, and the Asian Tigers were able to compete in the global market by understanding the Western rules and beating the West at its own game. Though the Western perspective will remain strong as people emulate a “developed world” lifestyle due to the forces already in motion, the sheer volume of users and producers in China and India will slowly but surely establish a new set of values. New measures of value will include things like community and togetherness, creative expression, accessibility, and flexibility. To figure out how to play by the rules of indigenous markets, companies must look closely at what people in those markets are doing with products and services. Spontaneous adaptation will provide a source of inspiration and understanding of the core values, aspirations, and unmet needs of the domestic consumers of countries like China and India. Companies ought to pay special attention to the successes that feel most “foreign” to them. These cultural breakthroughs will point to new opportunities and new markets (IFTF 145).

If American and African blacks are able to make the requisite social and commercial linkages, indigenous development of technology can be an important strategic asset, even in the face of poverty. Therefore, the former victims of the digital divide will begin to take charge of what Ortega calls our “own program.”

The world today is made, it is powered by science;
and for any man to abdicate an interest in science
is to walk with open eyes toward slavery.

-- Jacob Bronowski

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Notes

[i] **Obsolete Educational Focus**

The biggest problem with the US educational system is its thrust. It still attempts to educate for the Industrial Revolution. It has not begun to recognize the unique needs of an information-based society. In the 1980s, Alvin Toffler cal1ed our educational system's thrust, 'The Covert Curriculum.' Consider his theory that as work shifted out of the fields and the home, children had to be prepared for factory life. If young people could be prepared to fit into to the industrial system, it would vastly ease the problems of industrial discipline later on. The result was mass education. Built on the factory model, mass education taught basic reading, writing, arithmetic, and a bit of history. This was the 'overt curriculum.' But beneath it lay an invisible or 'covert curriculum' that was far more basic. It consisted of three courses: punctuality, obedience, and rote, repetitive work. Factory labor demanded workers who showed up on time, workers who would take orders from a management hierarchy without questioning, and workers who were willing and able to perform repetitive, routine, mechanistic jobs (Toffler, Third Wave 22-248). Combine Toffler's view with that of the linearity and modularity of the universe espoused by Newton, Bacon, and Descartes and one begins to see where we can improve the educational process.

The worldview and value system that lie at the basis of our culture and that have to be carefully re-examined, were formulated in their essential outlines in the sixteenth and seventeenth centuries. The medieval notion of an organic, living, and spiritual universe was replaced by that of the world as a machine, and the world-machine became the dominant metaphor of the modern era. This development was brought about by the revolutionary changes in physics and astronomy, culminating in the works of Isaac Newton. The science of the seventeenth century was based upon a new method of experimental or empirical inquiry advocated by Francis Bacon involved the mathematical description of nature and the analytic method of reasoning espoused by Rene' Descartes. (Capra Turning Point, 15-410).

The Scientific Revolution's major flaw was that it tossed all subjective data and human experience aside. Any phenomenon that could not be quantified was rejected. It assumed that time was linear, people were like machines, there was no room for values, and that less technically advanced cultures had nothing other than natural resources to contribute to society. These ideas fostered racism, nationalism, colonial exploitation, and a capitalist economy based on greed, perceived unlimited resources, desires for unlimited growth, and the exploitation of nature.

According to Toffler, for most American adults, their entire learning process has been little more than a twelve to sixteen year training program for the Newtonian worldview. In school emphasis was placed on quantities, distance, and location but rarely on qualities or conceptions. Think of all the tests one was forced to take where the only questions asked were those concerning dates, names, places, and things that could be precisely measured. True, false, fill in the blanks, multiple choice, and matching answers are all based on Newton's concept of causality –- that for every set of initial conditions there is one and only one correct final state. The most important aspect of such tests was not the answers but the process. One forgets specific facts over time, but few will ever forget the concept of causality after being subjected to the testing process for so many years.

Thinking in terms of the Newtonian worldview is not totally incorrect, but is insufficient for today's realities. When educators claim they are teaching children how to think, this is the particular type of thinking they too often have in mind -- linear, cause-and-effect, narrow-minded, yes/no, black/white, all-or-nothing thinking. There is no room for common sense, personal experience, and intuition.

The thinking process of the Newtonian paradigm was important because it produced results, and that meant learning facts. The more bits of information a student regurgitates, the better his or her grade. Facts are valuable because they help one to better understand the world and to better organize one's life. However, the amount of facts we know about the world is doubling every few years. Yet one would be hard pressed to claim that the world is becoming more organized as a result. One must free oneself from over-reliance on facts and train oneself and one's children to 'learn how to learn' (Toffler).

The American educational process and the job market are devoted to specialization. Visit any university and you will see people walking from labs and classrooms each with a briefcase or backpack crammed with facts about the carrier's own discipline. Every time one learns something new and different about the universe, a new academic or professional discipline is set up to collect and interpret new data. Learning has become fragmented into tinier frameworks of study on the Newtonian assumption that the more we know about the individual parts, the more we will be able to make deductions about the whole the parts make up (Rifkin 93-230). With the exception of multidisciplinary programs, such as Stanford's graduate Masters in Liberal Arts and similar ones endorsed by the Associate of Graduate Liberal Studies Programs (AGLSP), the cardinal sin among academicians has too often been fraternization. Too many scholars would never cross-check notes with those in other disciplines. Interdisciplinary approaches have often been labeled 'not serious.' Yet it is these types of approaches that are needed today.

[ii] Appropriate Educational Approach in the Information Age

Michelle Small recommends that the emphasis in learning must dramatically shift from its present industrial era approach. For example, education should stress process over measurement. The notion of collecting, storing and exploiting isolated facts should be replaced with the idea of examining the flow of interconnected phenomena. Testing needs to focus on conceptual abilities over empirical ones. Essays, oral discourse, and practical experience should become standard forms, reflecting the need to think in terms of process. The external world needs to be seen not be a series of isolated causal relationships, but as a web of interrelated phenomena expressing many possible scenarios for movement and changes. More than any other revolution in education, children need to be taught how to expect and adapt to rapid change (Small).

In addition, life-long learning will be increasingly seen as necessary. Besides on the job training, leaves of absence, seminars, short courses, co-op learning programs, the emphasis of the educational process should shift to innovative learning. Innovative learning, as advocated by James Botkins, is the process of preparing individuals and societies to act in concert in new situations. Botkins advocates training oneself how to learn and apply technologies in changing situations, i.e., one learns how to learn. This is not meant to ignore other actions involving political power, science, economic policies, and cultural differences, but to incorporate them with anticipation and participation.

Anticipation is the capacity to face new situations. Anticipatory learning stresses preparation for future alternatives, not adaptation to the present. It goes beyond foreseeing or choosing among desirable trends and averting catastrophic ones. It also enhances the ability to create new alternatives. Its opposite is adaptive, reactive learning, where one responds only to given changes in the environment, delaying the search for alternatives until it may be too late to implement solutions. Under maintenance learning those who really should be alarmed are not moved by gradual deterioration. It is only when events explode that people suddenly look up for the cause, which has already passed.

Participation forces individuals to have direct influence in the decision-making process, to strive for equality, and to reject limiting roles. An intrinsic goal of effective participation will be an interweaving of the demand for rights with an offer to fulfill the obligations that such rights entail.

Activating the latent potential of innovative learning over a life long period hinges largely on the degree of effective participation and the ability to anticipate technical and social changes (Botkins 339-341). With the dramatic changes that will continually face the global society, does it make sense to limit learning to a pre-programmed, Newtonian, linear, non-flexible, few doses of reading, writing, and arithmetic?

With a life long innovative, holistic approach to education established, one might also borrow several ideas from Joel de Rosnay's Le Macroscope. (Small 345-349). Avoid traditional linear or sequential approaches and favor those that consists of coming back many times at different levels over the material that must be understood and assimilated. This approach, for example, would proscribe the chapter-by-chapter method of teaching. Only when the work under study has been read, discussed, and evaluated in depth should the slow, analytical process start. It is only when one sees the total picture of a jigsaw puzzle that one can appreciate its discrete components and interrelationships. Avoid definitions that are so precise that they either polarize or limit the play of imaginations. Stress the importance of the concepts of limits, mutual causality, interdependence and dynamic equilibrium in the study of complex systems; taking as examples the disciplines which integrate the notions of time and irreversibility, such as biology, ecology, and economics. Use a thematic approach at the vertical level that can integrate many disciplines and different levels of complexity around a central core. Never separate the knowledge of the facts from the understanding of the relationships that link them. Emphasize the notion of Heisenberg's Uncertainty Principle, which debunks the myth of objectivity and shows that the observer is irrevocably bound to the observed. Stress the multiplicity of individual and cultural values and the relativism of worldviews. Allow for, and encourage an intuitive, creative, non-rational approach to problem solving.

More broadly, liberal education is and will continue to be a failed idea as long as students are shut off from, or only superficially acquainted with, knowledge of the kinds of questions science can and cannot answer. Nor can liberal education be a success as long as students are unable to evaluate the evidence of their own experience. David Saxon, former President of the University of California at Berkeley suggests the following program. First, students should be helped to understand the nature of physical laws -- what they are and what they are not, what they can tell us about the physical world and what they cannot, how they are arrived at, and in what sense they are true. Second, students should have some grounding in the laws of probability and chance, and thus some understanding that in a world as complex as ours both statistical fluctuations and the accidental coincidence of unrelated events happen all the time. Third, the idea should be conveyed that science is not a collection of isolated facts but a highly unified and consistent view of the world. Finally, they should understand that science has a foundation of large general laws that link together various observations about the physical world and provide a framework within which various potentialities, facts and theories can be evaluated.

Saxon argued that science is an intellectual activity that is tied to the same wellspring that motivates us to study the liberal arts. Further, he stated, "The ability to distinguish sense from nonsense is an indispensable aspect of a liberal education."

When those fundamental directions have been established, the technological ICT hardware can be utilized to its fullest potential and smoothly integrated within the new education as a useful tool instead of as a haphazard, uncoordinated, stop-gap measure. Students will be encouraged to work at their own pace with the mode that best suits them.

In addition, continuous refinements in computer and communications industries are tearing down the fictional barriers that have been erected between schools and society. One can facilitate this process and help make education a true learning experience related to the world outside by pursuing alternative modes, including life-long education which would allow adults to retrain themselves for other careers or to pursue special interests so that they can be happier and feel more at ease in our fast-changing society (Small 345-349).

[iii] Additional Perspectives on the Evolution of Technology

José Ortega y Gasset (1883-1955) categorized the progression of technological sophistication in this order: the *Technology of Chance*, *Technology of the Craftsman*, and the *Technology of the Technician*.

Primitive man uses the *Technology of Chance*, what Ortega calls the 'aha-impression.' "He is not aware of his technology as such; he is unconscious of the fact that there is among his faculties one which enables him to refashion nature after his desires. His inventions are not the result of premeditated and deliberate search. He does not look for them; they seem rather to look for him. Primitive man does not look upon himself as the inventor of his inventions. Invention appears to him as another dimension of nature, as part of nature's power to furnish him – nature furnishing man, not man nature – with certain novel devices" (Ortega 142-144).

The *Technology of the Craftsman* causes society to recognize technology as a conscious independent entity performed by artisans, the peculiar set of activities of which are not natural to all men" (Ortega 146). For example, Mesopotamia shows evidence of being the most advanced technological society of its era. Over a 6,000 year period, Mesopotamian technology included advances in carpentry, glassmaking, textile manufacture, leather-working, perfume-making, farming, food preparation, irrigation, flood control, canal-building, water storage, drainage, brewing, and their tablets also provide detail on the economics of various industries (Roaf 126). The most basic indication of a settled, rather than nomadic, lifestyle is pottery. Decorated pottery found at Tell Hassuna indicates a mastery of kilns providing higher temperatures for baking non-porous jars as early as the middle of the 7th millennium BC (Roaf 39). "During the 4th millennium, there were major developments in metallurgy," according to Roaf. Smelted copper, alloys of copper and arsenic, lead, gold and silver ornaments benefited from the use of lost-wax casting techniques (Roaf 72). Sir Leonard Woolley's excavations of more than 1,000 graves in the Royal Cemetery at Ur show a complete mastery of jewelry making techniques using composite objects, inlaid stones, and sophisticated geometric designs (Roaf 92). Intensified agriculture based on large scale water management networks constructed and maintained as public works by conscripted labor gangs (corvee) and slaves under the supervision of state-employed engineers is the critical foundation of their civilization. Main canals were nearly 75 feet wide, had hundreds of connecting channels, and ran for several miles (McClellan 31-35). Perhaps the most impressive engineering achievements of ancient Mesopotamia are the series of ziggurats found throughout the region as early as 2100 BC in Ur, 1900 BC in Babylon, and 900 BC in Assyria. In addition, the Assyrians of Nineveh under the leadership of Sargon II (722-670 BC) and his son Sennacherib dominated the Near East with its iron-equipped armies, battering rams, and horse-drawn chariots (Derry 12).

Writing appeared in Mesopotamia in the 4th millennium BC. Mathematics was supported by the state and temple authorities, principally to maintain its agricultural economy. For example, 85 percent of cuneiform tablets uncovered at Uruk (3,000 BC) represented economic records (McClellan 47). This administrative nature of mathematics also explained the Mesopotamians' tradition of recording verbal and quantitative information in the form of lists.

Many science historians argue that ancient Mesopotamian and Egyptian advanced civilizations were purely the result of applied engineering and skilled trades, rather than any formal theories of the underlying physical phenomena. According to McClellan and Dorn:

> In most historical situations prior to the 20 Century, science and technology have progressed in either partial of full isolation from each other – both intellectually and sociologically" (McClellan 2). "Since higher learning was heavily skewed toward useful knowledge and its applications, in this sociological sense applied science, in fact, preceded pure science or abstract theoretical research later fostered by the Greeks" (McClellan 46). The Mesopotamians recorded knowledge in lists, "rather than in any analytical system of theorems or generalizations…[and pursued it with] a notable lack of abstraction or generality and without any of the naturalistic theory or goal of knowledge as an end in its own right that the Greeks later emphasized (McClellan 47).

They argue that practical knowledge embodied in the crafts is different from knowledge derived from some abstract understanding of a phenomenon (McClellan 13). They believe that Mesopotamia achieved this level of advancement without the kind of abstract science and mathematics, later practiced by the Greeks.

Alternatively, archaeologists, such as Jean Bottero of the Ecole Pratique des Hautes Etudes in Paris, argue that Mesopotamia indeed practiced an early form of abstract thinking and used mathematical astronomy as the bridge between engineering and science. Since the ancient Mesopotamians considered every aspect of the material universe as appropriate subjects of study for the purpose of extracting the plans of the gods, a deductive form of divination can be inferred from the writings found in texts such as The Great Treatise on Astrology. Divination was originally empirical, based on a simple set of observations of historical events that the Mesopotamians thought would repeat itself. These unusual events, and similar appearances, were grouped and were "multiplied in the eyes of the people who believed in them," notes Bottero. The first phenomenon would signal the second, and the two together were recorded as an oracle of universal value. To our modern sensibilities this would seem extremely superstitious, however, to the Mesopotamians, this allowed the practitioners to expect to see a repetition of an analogous event in the destiny of the king or the land, whenever the anomaly was noticed again (Bottero 131). As the practice became institutionalized, Bottero believes that the Mesopotamians' desire to analyze and systematize their observations led to a deductive reasoning that went beyond the observed reality into the realm of the possible. "Mesopotamian divination attempted to study its subject as universal, and in a certain sense in abstracto, which is also one of the characteristics of scientific knowledge," explains Bottero (Bottero 127-135). He drives the point further, especially as divination was increasingly linked to mathematical astronomy:

> "From a knowledge based on pure observation a posteriori, starting from individual cases that were fortuitous and unforeseeable, divination became thus a-priori knowledge, before the end of the third millennium at least. That knowledge was deductive, systematic, capable of foreseeing, and had a necessary, universal and, in its own way, abstract object, and even had its own manuals. That is what we call a science, in the proper and formal sense of the word" (Bottero 136).

The University of Chicago's renowned Assyriologist A. Leo Oppenheim also notes that, "They convey the procedure as such without the elaboration of the numerical results, using measurements and other given numbers solely to illustrate the operations described" (Oppenheim 307).

Ortega's *Technology of the Craftsman* would also apply to ancient Egypt. While Mesopotamian society, with its collection of cities, is perhaps the first known civilization, in the strictest sense of the word, Egypt was the first state and was by far the oldest continuous state. However, one should note that urban-based civilizations unfolded independently in multiple centers across the world. A pattern of Neolithic settlements coalescing into centralized kingdoms based on intensified, hydraulically-enabled, agriculture occurs at least six times in different sites: Mesopotamia after 3500 BCE, Egypt after 3400 BCE, Indus River Valley after 2500 BCE, along the Hwang Ho (Yellow River) after 1800 BCE, Mesoamerica after 500 BCE, and South America after 300 BCE (McClellan 32).

Like Mesopotamia, Egypt showed evidence of having a very advanced engineering capability. Settled city life facilitated new forms of technologies, such as metalworking, pottery, stone carving, and new forms of social organization. Bronze metals (copper alloyed with tin) offered distinct advantages over stone as tools and weapons, so control over Sinai copper mines was of great importance to Egypt. Metalworking involved a complicated set of technologies, including mining ore, smelting, hammering or casting the metal into useful tools. Bronze metallurgy required furnaces with bellows to raise temperatures to 1,100 degrees Celsius (McClellan 41). Increased crop yields, surpluses, and wealth led to a desire to trade with neighbors, even distant ones, for luxury items and raw materials, including Nubian gold. By the close of the Bronze Age, the tomb of Tutankhamen showed the exquisite achievements of the Egyptians in fine arts, in the service of the religious mortuary cults. Here we find works in gold, silver, semi-precious metals, ivory, and curved furniture unrivalled by European technique until the Renaissance (Derry11).

As Basil Davidson notes, "The time span from *homo habilis* with his earliest tools to Neolithic man with his farming cannot in any case be much less than two million years. Yet not much more than two thousand years separate the earliest farmers who settled along the river Nile from the mathematically precise builders of the monuments of Egypt" (Davidson 14). They benefited from a fruitful interaction with the environment through invention, and they experienced a 'feedback relationship' between environment, biological evolution, and cultural change. The settled life enabled the Egyptians to be handier, more skillful, and better able to think and to act by thought than their ancestors (Davidson 13).

In Ortega's *Technology of the Craftsman* or what Romano Guardini called a *contrivance*, technological change has generally been empirically derived, simply by trial and error. The method used in proceeding to the development of new technological advances is determined primarily on the basis of two factors: the existing technology and the existing knowledge of the properties of matter and energy, i.e., existing scientific knowledge. This scientific knowledge used in technology is not a replacement for the trial-and-error methodology of technology. Rather, it provides a means of selecting what trial to undertake next and thus contributes to the efficiency and effectiveness of the trial-and-error method. Technology can use scientific knowledge and, in this sense, it can be sometimes viewed as applied science. Yet, much technology continues to be developed with little or no basic scientific knowledge. BBC reporter and author of Connections, James Burke, presented a good summary of the ways in which the popular culture assumes that technologists experience the effects of economics and human values. Burke designates six major initiators of technical innovation. They are: deliberate invention, accidents, spin-offs, war, religion, and the environment.

First, as one might expect, technical innovation occurs as a result of deliberate attempts to develop it. When inventors like Lewis Howard Latimer and Thomas Edison began work on the incandescent bulb, it was done in response to the inadequacy of the arc light. All the means were available: a vacuum pump to evacuate the bulb, electric current, the filament which the arc light used, and carbon for the filament. With these components the remainder of the required work was the synthesis of technologies toward a definite goal --the light bulb's creation.

A second factor that frequently occurs is that an attempt to find one thing leads to the discovery of another. For example, William Perkin, searching for an artificial form of quinine, used some of the molecular combinations available in coal tar and accidentally found that the black sludge produced by one of his experiments turned out to be the first artificial aniline dye.

Unrelated developments have decisive effects on the primary event. An example of such spin-off developments can be seen by the development of paper. The medieval textile revolution, which was based upon the use of the spinning wheel and the horizontal loom, lowered the price of linen to the point where enough of it became available in rag form to revolutionize the paper industry. Burke discusses other examples of how unforeseen circumstances play a leading role in technical innovation. This includes the stimulation of mining activities for metals to make cannons when Chinese gunpowder was exported to Europe and the development of a barometer as a result of frequent flooding of mines and the failure of pumps.

The fourth and fifth factors are all too familiar: war and religion. The need to find more effective means of defense (or offense) has driven technology from the most ancient of times. The use of the cannon led to defensive architectural developments that made use of astronomical instruments. Ancient Mesopotamian, Egyptian, and Mesoamerican religious beliefs led to great strides in engineering and architecture and the Islamic world fostered advanced astronomy because of the need to pray, feast and fast at specific times.

Finally, physical and climatic conditions play important roles. For example, the extreme changes in Europe's winters in the 12th and 13th centuries provided urgent need for more efficient heating. The chimney filled the need and had a profound effect on the cultural life of that continent.

Regardless of the causal effect, it is clear that there is interplay between the cultural philosophy of an era and the approach to that era's application of knowledge through technology. Robert Hammond defines technology (engineering) as a means by which the knowledge of mathematical and rational sciences is applied with *judgment* to develop ways to utilize the materials and forces of nature for the benefit of mankind (Hammond 5). As a result of overt human goals and subjective human judgment, technology is never neutral because it is directed in specific instances toward specific material objects. It is just these value-based judgments that are being questioned today.

In the past the actions of individuals or single industries or even single nations mattered little to the outcome of the world. Modern technology is quantitatively more pervasive in society and leads to qualitative changes. To what degree are these new technologies radically different in how they open entirely new doors for human control, extension, non-physical evolution, or catastrophic destruction? Let us now examine what Ortega called the *Technology of the Technician*, which happens when the tool works by itself to produce the object. It is also what Guardini considered as the 'machine' whose "function is scientifically understood and technically worked out so that the mode of operation can be accurately fixed" (Guardini 100). At this point, handiwork is surpassed by mechanical production, which is then bifurcated into two components, according to Ortega – the invention the plan of activity and the handling of the raw material

(Ortega 148-149). As noted by Leroi-Gourhan, what we have today is technology that is a child of human intelligence, but one completely freed from genetic ties. “Our techniques, which have been an extension of our bodies since the first Australanthropian made the first chopper, have reenacted at a dizzying speed events of millions of years of geological evolution until, today, we can already use an artificial nervous system and an electronic intelligence.” (Leroi-Gourhan 173). In addition to separation of planning and work, in this mode, humans themselves risk becoming separated from the technology that is working on their behalf and from other humans in the process. As Adorno and Horkheimer warn, “Not only is domination paid for with the estrangement of human beings from the dominated objects, but the relationships of human beings, including the relationships of individuals to themselves, have themselves been bewitched by the objectification of the mind” (Horkheimer 21).

[iv] **ACM Code of Ethics and Professional Conduct**

Adopted by ACM Council 10/16/92.

Preamble

Commitment to ethical professional conduct is expected of every member (voting members, associate members, and student members) of the Association for Computing Machinery (ACM).

This Code, consisting of 24 imperatives formulated as statements of personal responsibility, identifies the elements of such a commitment. It contains many, but not all, issues professionals are likely to face. Section 1 outlines fundamental ethical considerations, while Section 2 addresses additional, more specific considerations of professional conduct. Statements in Section 3 pertain more specifically to individuals who have a leadership role, whether in the workplace or in a volunteer capacity such as with organizations like ACM. Principles involving compliance with this Code are given in Section 4.

The Code shall be supplemented by a set of Guidelines, which provide explanation to assist members in dealing with the various issues contained in the Code. It is expected that the Guidelines will be changed more frequently than the Code.

The Code and its supplemented Guidelines are intended to serve as a basis for ethical decision making in the conduct of professional work. Secondarily, they may serve as a basis for judging the merit of a formal complaint pertaining to violation of professional ethical standards.

It should be noted that although computing is not mentioned in the imperatives of Section 1, the Code is concerned with how these fundamental imperatives apply to one's conduct as a computing professional. These imperatives are expressed in a general form to emphasize that ethical principles, which apply to computer ethics, are derived from more general ethical principles.

It is understood that some words and phrases in a code of ethics are subject to varying interpretations, and that any ethical principle may conflict with other ethical principles in specific situations. Questions related to ethical conflicts can best be answered by thoughtful consideration of fundamental principles, rather than reliance on detailed regulations.

1. GENERAL MORAL IMPERATIVES.
As an ACM member I will ....

1.1 Contribute to society and human well-being.

This principle concerning the quality of life of all people affirms an obligation to protect fundamental human rights and to respect the diversity of all cultures. An essential aim of computing professionals is to minimize negative consequences of computing systems, including threats to health and safety. When designing or implementing systems, computing professionals must attempt to ensure that the products of their efforts will be used in socially responsible ways, will meet social needs, and will avoid harmful effects to health and welfare.

In addition to a safe social environment, human well-being includes a safe natural environment. Therefore, computing professionals who design and develop systems must be alert to, and make others aware of, any potential damage to the local or global environment.

1.2 Avoid harm to others.

"Harm" means injury or negative consequences, such as undesirable loss of information, loss of property, property damage, or unwanted environmental impacts. This principle prohibits use of computing technology in ways that result in harm to any of the following: users, the general public, employees, employers. Harmful actions include intentional destruction or modification of files and programs leading to serious loss of resources or unnecessary expenditure of human resources such as the time and effort required to purge systems of "computer viruses."

Well-intended actions, including those that accomplish assigned duties, may lead to harm unexpectedly. In such an event the responsible person or persons are obligated to undo or mitigate the negative consequences as much as possible. One way to avoid unintentional harm is to carefully consider potential impacts on all those affected by decisions made during design and implementation.

To minimize the possibility of indirectly harming others, computing professionals must minimize malfunctions by following generally accepted standards for system design and testing. Furthermore, it is often necessary to assess the social consequences of systems to project the likelihood of any serious harm to others. If system features are misrepresented to users, coworkers, or supervisors, the individual computing professional is responsible for any resulting injury.

In the work environment the computing professional has the additional obligation to report any signs of system dangers that might result in serious personal or social damage. If one's superiors do not act to curtail or mitigate such dangers, it may be necessary to "blow the whistle" to help correct the problem or reduce the risk. However, capricious or misguided reporting of violations can, itself, be harmful. Before reporting violations, all relevant aspects of the incident must be thoroughly assessed. In particular, the assessment of risk and responsibility must be credible. It is suggested that advice be sought from other computing professionals. See principle 2.5 regarding thorough evaluations.

1.3 Be honest and trustworthy.

Honesty is an essential component of trust. Without trust an organization cannot function effectively. The honest computing professional will not make deliberately false or deceptive claims about a system or system design, but will instead provide full disclosure of all pertinent system limitations and problems.

A computer professional has a duty to be honest about his or her own qualifications, and about any circumstances that might lead to conflicts of interest.

Membership in volunteer organizations such as ACM may at times place individuals in situations where their statements or actions could be interpreted as carrying the "weight" of a larger group of professionals. An ACM member will exercise care to not misrepresent ACM or positions and policies of ACM or any ACM units.

1.4 Be fair and take action not to discriminate.

The values of equality, tolerance, respect for others, and the principles of equal justice govern this imperative. Discrimination on the basis of race, sex, religion, age, disability, national origin, or other such factors is an explicit violation of ACM policy and will not be tolerated.

Inequities between different groups of people may result from the use or misuse of information and technology. In a fair society,all individuals would have equal opportunity to participate in, or benefit from, the use of computer resources regardless of race, sex, religion, age, disability, national origin or other such similar factors. However, these ideals do not justify unauthorized use of computer resources nor do they provide an adequate basis for violation of any other ethical imperatives of this code.

1.5 Honor property rights including copyrights and patent.

Violation of copyrights, patents, trade secrets and the terms of license agreements is prohibited by law in most circumstances. Even when software is not so protected, such violations are contrary to professional behavior. Copies of software should be made only with proper authorization. Unauthorized duplication of materials must not be condoned.

1.6 Give proper credit for intellectual property.

Computing professionals are obligated to protect the integrity of intellectual property. Specifically, one must not take credit for other's ideas or work, even in cases where the work has not been explicitly protected by copyright, patent, etc.

1.7 Respect the privacy of others.

Computing and communication technology enables the collection and exchange of personal information on a scale unprecedented in the history of civilization. Thus there is increased potential for violating the privacy of individuals and groups. It is the responsibility of professionals to maintain the privacy and integrity of data describing individuals. This includes taking precautions to ensure the accuracy of data, as well as protecting it from unauthorized access or accidental disclosure to inappropriate individuals. Furthermore, procedures must be established to allow individuals to review their records and correct inaccuracies.

This imperative implies that only the necessary amount of personal information be collected in a system, that retention and disposal periods for that information be clearly defined and enforced, and that personal information gathered for a specific purpose not be used for other purposes without consent of the individual(s). These principles apply to electronic communications, including electronic mail, and prohibit procedures that capture or monitor electronic user data, including messages,without the permission of users or bona fide authorization related to system operation and maintenance. User data observed during the normal duties of system operation and maintenance must be treated with strictest confidentiality, except in cases where it is evidence for the violation of law, organizational regulations, or this Code. In these cases, the nature or contents of that information must be disclosed only to proper authorities.

1.8 Honor confidentiality.

The principle of honesty extends to issues of confidentiality of information whenever one has made an explicit promise to honor confidentiality or, implicitly, when private information not directly related to the performance of one's duties becomes available. The ethical concern is to respect all obligations of confidentiality to employers, clients, and users unless discharged from such obligations by requirements of the law or other principles of this Code.

2. MORE SPECIFIC PROFESSIONAL RESPONSIBILITIES.
As an ACM computing professional I will ....

2.1 Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work.

Excellence is perhaps the most important obligation of a professional. The computing professional must strive to achieve quality and to be cognizant of the serious negative consequences that may result from poor quality in a system.

2.2 Acquire and maintain professional competence.

Excellence depends on individuals who take responsibility for acquiring and maintaining professional competence. A professional must participate in setting standards for appropriate levels of competence, and strive to achieve those standards. Upgrading technical knowledge and competence can be achieved in several ways:doing independent study; attending seminars, conferences, or courses; and being involved in professional organizations.

2.3 Know and respect existing laws pertaining to professional work.

ACM members must obey existing local, state,province, national, and international laws unless there is a compelling ethical basis not to do so. Policies and procedures of the organizations in which one participates must also be obeyed. But compliance must be balanced with the recognition that sometimes existing laws and rules may be immoral or inappropriate and, therefore, must be challenged. Violation of a law or regulation may be ethical when that law or rule has inadequate moral basis or when it conflicts with another law judged to be more important. If one decides to violate a law or rule because it is viewed as unethical, or for any other reason, one must fully accept responsibility for one's actions and for the consequences.

2.4 Accept and provide appropriate professional review.

Quality professional work, especially in the computing profession, depends on professional reviewing and critiquing. Whenever appropriate,individual members should seek and utilize peer review as well as provide critical review of the work of others.

2.5 Give comprehensive and thorough evaluations of computer systems and their impacts, including analysis of possible risks.

Computer professionals must strive to be perceptive, thorough, and objective when evaluating, recommending, and presenting system descriptions and alternatives. Computer professionals are in a position of special trust, and therefore have a special responsibility to provide objective, credible evaluations to employers, clients, users, and the public. When providing evaluations the professional must also identify any relevant conflicts of interest, as stated in imperative 1.3.

As noted in the discussion of principle 1.2 on avoiding harm, any signs of danger from systems must be reported to those who have opportunity and/or responsibility to resolve them. See the guidelines for imperative 1.2 for more details concerning harm,including the reporting of professional violations.

2.6 Honor contracts, agreements, and assigned responsibilities.

Honoring one's commitments is a matter of integrity and honesty.For the computer professional this includes ensuring that system elements perform as intended. Also, when one contracts for work with another party, one has an obligation to keep that party properly informed about progress toward completing that work.

A computing professional has a responsibility to request a change in any assignment that he or she feels cannot be completed as defined. Only after serious consideration and with full disclosure of risks and concerns to the employer or client, should one accept the assignment. The major underlying principle here is the obligation to accept personal accountability for professional work. On some occasions other ethical principles may take greater priority.

A judgment that a specific assignment should not be performed may not be accepted. Having clearly identified one's concerns and reasons for that judgment, but failing to procure a change in that assignment, one may yet be obligated, by contract or by law, to proceed as directed. The computing professional's ethical judgment should be the final guide in deciding whether or not to proceed. Regardless of the decision, one must accept the responsibility for the consequences.

However, performing assignments "against one's own judgment" does not relieve the professional of responsibility for any negative consequences.

2.7 Improve public understanding of computing and its consequences.

Computing professionals have a responsibility to share technical knowledge with the public by encouraging understanding of computing, including the impacts of computer systems and their limitations. This imperative implies an obligation to counter any false views related to computing.

2.8 Access computing and communication resources only when authorized to do so.

Theft or destruction of tangible and electronic property is prohibited by imperative 1.2 - "Avoid harm to others." Trespassing and unauthorized use of a computer or communication system is addressed by this imperative. Trespassing includes accessing communication networks and computer systems, or accounts and/or files associated with those systems, without explicit authorization to do so. Individuals and organizations have the right to restrict access to their systems so long as they do not violate the discrimination principle (see 1.4). No one should enter or use another's computer system, software, or data files without permission. One must always have appropriate approval before using system resources, including communication ports, file space, other system peripherals, and computer time.

3. ORGANIZATIONAL LEADERSHIP IMPERATIVES.
As an ACM member and an organizational leader, I will ....

BACKGROUND NOTE:This section draws extensively from the draft IFIP Code of Ethics,especially its sections on organizational ethics and international concerns. The ethical obligations of organizations tend to be neglected in most codes of professional conduct, perhaps because these codes are written from the perspective of the individual member. This dilemma is addressed by stating these imperatives from the perspective of the organizational leader. In this context"leader" is viewed as any organizational member who has leadership or educational responsibilities. These imperatives generally may apply to organizations as well as their leaders. In this context"organizations" are corporations, government agencies,and other "employers," as well as volunteer professional organizations.

3.1 Articulate social responsibilities of members of an organizational unit and encourage full acceptance of those responsibilities.

Because organizations of all kinds have impacts on the public, they must accept responsibilities to society. Organizational procedures and attitudes oriented toward quality and the welfare of society will reduce harm to members of the public, thereby serving public interest and fulfilling social responsibility. Therefore,organizational leaders must encourage full participation in meeting social responsibilities as well as quality performance.

3.2 Manage personnel and resources to design and build information systems that enhance the quality of working life.

Organizational leaders are responsible for ensuring that computer systems enhance, not degrade, the quality of working life. When implementing a computer system, organizations must consider the personal and professional development, physical safety, and human dignity of all workers. Appropriate human-computer ergonomic standards should be considered in system design and in the workplace.

3.3 Acknowledge and support proper and authorized uses of an organization's computing and communication resources.

Because computer systems can become tools to harm as well as to benefit an organization, the leadership has the responsibility to clearly define appropriate and inappropriate uses of organizational computing resources. While the number and scope of such rules should be minimal, they should be fully enforced when established.

3.4 Ensure that users and those who will be affected by a system have their needs clearly articulated during the assessment and design of requirements; later the system must be validated to meet requirements.

Current system users, potential users and other persons whose lives may be affected by a system must have their needs assessed and incorporated in the statement of requirements. System validation should ensure compliance with those requirements.

3.5 Articulate and support policies that protect the dignity of users and others affected by a computing system.

Designing or implementing systems that deliberately or inadvertently demean individuals or groups is ethically unacceptable. Computer professionals who are in decision making positions should verify that systems are designed and implemented to protect personal privacy and enhance personal dignity.

3.6 Create opportunities for members of the organization to learn the principles and limitations of computer systems.

This complements the imperative on public understanding (2.7). Educational opportunities are essential to facilitate optimal participation of all organizational members. Opportunities must be available to all members to help them improve their knowledge and skills in computing, including courses that familiarize them with the consequences and limitations of particular types of systems.In particular, professionals must be made aware of the dangers of building systems around oversimplified models, the improbability of anticipating and designing for every possible operating condition, and other issues related to the complexity of this profession.

4. COMPLIANCE WITH THE CODE.
As an ACM member I will ....

4.1 Uphold and promote the principles of this Code.

The future of the computing profession depends on both technical and ethical excellence. Not only is it important for ACM computing professionals to adhere to the principles expressed in this Code, each member should encourage and support adherence by other members.

4.2 Treat violations of this code as inconsistent with membership in the ACM.

Adherence of professionals to a code of ethics is largely a voluntary matter. However, if a member does not follow this code by engaging in gross misconduct, membership in ACM may be terminated.

This Code and the supplemental Guidelines were developed by the Task Force for the Revision of the ACM Code of Ethics and Professional Conduct: Ronald E. Anderson, Chair, Gerald Engel, Donald Gotterbarn, Grace C. Hertlein, Alex Hoffman, Bruce Jawer, Deborah G. Johnson, Doris K. Lidtke, Joyce Currie Little, Dianne Martin, Donn B. Parker, Judith A. Perrolle, and Richard S. Rosenberg. The Task Force was organized by ACM/SIGCAS and funding was provided by the ACM SIG Discretionary Fund. This Code and the supplemental Guidelines were adopted by the ACM Council on October 16, 1992.

ACM/Code of Ethics. Last Update: 01/16/98 by HK.

[v] **IEEE Code of Ethics**

We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

1. to accept responsibility in making engineering decisions consistent with the safety, health and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;

2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;

3. to be honest and realistic in stating claims or estimates based on available data;

4. to reject bribery in all its forms;

5. to improve the understanding of technology, its appropriate application, and potential consequences;

6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;

7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;

8. to treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin;

9. to avoid injuring others, their property, reputation, or employment by false or malicious action;

10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics.

Approved by the IEEE Board of Directors, August 1990

[vi] **Software Engineering Code of Ethics and Professional Practice**

ACM/IEEE-CS Joint Task Force on
Software Engineering Ethics and Professional Practices

PREAMBLE

Computers have a central and growing role in commerce, industry, government, medicine, education, entertainment and society at large. Software engineers are those who contribute by direct participation or by teaching, to the analysis, specification, design, development, certification, maintenance and testing of software systems. Because of their roles in developing software systems, software engineers have significant opportunities to do good or cause harm, to enable others to do good or cause harm, or to influence others to do good or cause harm. To ensure, as much as possible, that their efforts will be used for good, software engineers must commit themselves to making software engineering a beneficial and respected profession. In accordance with that commitment, software engineers shall adhere to the following Code of Ethics and Professional Practice.

The Code contains eight Principles related to the behavior of and decisions made by professional software engineers, including practitioners, educators, managers, supervisors and policy makers, as well as trainees and students of the profession. The Principles identify the ethically responsible relationships in which individuals, groups, and organizations participate and the primary obligations within these relationships. The Clauses of each Principle are illustrations of some of the obligations included in these relationships. These obligations are founded in the software engineer’s humanity, in special care owed to people affected by the work of software engineers, and the unique elements of the practice of software engineering. The Code prescribes these as obligations of anyone claiming to be or aspiring to be a software engineer.

It is not intended that the individual parts of the Code be used in isolation to justify errors of omission or commission. The list of Principles and Clauses is not exhaustive. The Clauses should not be read as separating the acceptable from the unacceptable in professional conduct in all practical situations. The Code is not a simple ethical algorithm that generates ethical decisions. In some situations standards may be in tension with each other or with standards from other sources. These situations require the software engineer to use ethical judgment to act in a manner which is most consistent with the spirit of the Code of Ethics and Professional Practice, given the circumstances.

Ethical tensions can best be addressed by thoughtful consideration of fundamental principles, rather than blind reliance on detailed regulations. These Principles should influence software engineers to consider broadly who is affected by their work; to examine if they and their colleagues are treating other human beings with due respect; to consider how the public, if reasonably well informed, would view their decisions; to analyze how the least empowered will be affected by their decisions; and to consider whether their acts would be judged worthy of the ideal professional working as a software engineer. In all these judgments concern for the health, safety and welfare of the public is primary; that is, the "Public Interest" is central to this Code.

The dynamic and demanding context of software engineering requires a code that is adaptable and relevant to new situations as they occur. However, even in this generality, the Code provides support for software engineers and managers of software engineers who need to take positive action in a specific case by documenting the ethical stance of the profession. The Code provides an ethical foundation to which individuals within teams and the team as a whole can appeal. The Code helps to define those actions that are ethically improper to request of a software engineer or teams of software engineers.

The Code is not simply for adjudicating the nature of questionable acts; it also has an important educational function. As this Code expresses the consensus of the profession on ethical issues, it is a means to educate both the public and aspiring professionals about the ethical obligations of all software engineers.

PRINCIPLES
Principle 1: PUBLIC

Software engineers shall act consistently with the public interest. In particular, software engineers shall, as appropriate:

1.01. Accept full responsibility for their own work.

1.02. Moderate the interests of the software engineer, the employer, the client and the users with the public good.

1.03. Approve software only if they have a well-founded belief that it is safe, meets specifications, passes appropriate tests, and does not diminish quality of life, diminish privacy or harm the environment. The ultimate effect of the work should be to the public good.

1.04. Disclose to appropriate persons or authorities any actual or potential danger to the user, the public, or the environment, that they reasonably believe to be associated with software or related documents.

1.05. Cooperate in efforts to address matters of grave public concern caused by software, its installation, maintenance, support or documentation.

1.06. Be fair and avoid deception in all statements, particularly public ones, concerning software or related documents, methods and tools.

1.07. Consider issues of physical disabilities, allocation of resources, economic disadvantage and other factors that can diminish access to the benefits of software.

1.08. Be encouraged to volunteer professional skills to good causes and contribute to public education concerning the discipline.

Principle 2: CLIENT AND EMPLOYER

Software engineers shall act in a manner that is in the best interests of their client and employer, consistent with the public interest. In particular, software engineers shall, as appropriate:

2.01. Provide service in their areas of competence, being honest and forthright about any limitations of their experience and education.

2.02. Not knowingly use software that is obtained or retained either illegally or unethically.

2.03. Use the property of a client or employer only in ways properly authorized, and with the client's or employer's knowledge and consent.

2.04. Ensure that any document upon which they rely has been approved, when required, by someone authorized to approve it.

2.05. Keep private any confidential information gained in their professional work, where such confidentiality is consistent with the public interest and consistent with the law.

2.06. Identify, document, collect evidence and report to the client or the employer promptly if, in their opinion, a project is likely to fail, to prove too expensive, to violate intellectual property law, or otherwise to be problematic.

2.07. Identify, document, and report significant issues of social concern, of which they are aware, in software or related documents, to the employer or the client.

2.08. Accept no outside work detrimental to the work they perform for their primary employer.

2.09. Promote no interest adverse to their employer or client, unless a higher ethical concern is being compromised; in that case, inform the employer or another appropriate authority of the ethical concern.

Principle 3: PRODUCT

Software engineers shall ensure that their products and related modifications meet the highest professional standards possible. In particular, software engineers shall, as appropriate:

3.01. Strive for high quality, acceptable cost and a reasonable schedule, ensuring significant tradeoffs are clear to and accepted by the employer and the client, and are available for consideration by the user and the public.

3.02. Ensure proper and achievable goals and objectives for any project on which they work or propose.

3.03. Identify, define and address ethical, economic, cultural, legal and environmental issues related to work projects.

3.04. Ensure that they are qualified for any project on which they work or propose to work by an appropriate combination of education and training, and experience.

3.05. Ensure an appropriate method is used for any project on which they work or propose to work.

3.06. Work to follow professional standards, when available, that are most appropriate for the task at hand, departing from these only when ethically or technically justified.

3.07. Strive to fully understand the specifications for software on which they work.

3.08. Ensure that specifications for software on which they work have been well documented, satisfy the users' requirements and have the appropriate approvals.

3.09. Ensure realistic quantitative estimates of cost, scheduling, personnel, quality and outcomes on any project on which they work or propose to work and provide an uncertainty assessment of these estimates.

3.10. Ensure adequate testing, debugging, and review of software and related documents on which they work.

3.11. Ensure adequate documentation, including significant problems discovered and solutions adopted, for any project on which they work.

3.12. Work to develop software and related documents that respect the privacy of those who will be affected by that software.

3.13. Be careful to use only accurate data derived by ethical and lawful means, and use it only in ways properly authorized.

3.14. Maintain the integrity of data, being sensitive to outdated or flawed occurrences.

3.15 Treat all forms of software maintenance with the same professionalism as new development.

Principle 4: JUDGMENT

Software engineers shall maintain integrity and independence in their professional judgment. In particular, software engineers shall, as appropriate:

4.01. Temper all technical judgments by the need to support and maintain human values.

4.02 Only endorse documents either prepared under their supervision or within their areas of competence and with which they are in agreement.

4.03. Maintain professional objectivity with respect to any software or related documents they are asked to evaluate.

4.04. Not engage in deceptive financial practices such as bribery, double billing, or other improper financial practices.

4.05. Disclose to all concerned parties those conflicts of interest that cannot reasonably be avoided or escaped.

4.06. Refuse to participate, as members or advisors, in a private, governmental or professional body concerned with software related issues, in which they, their employers or their clients have undisclosed potential conflicts of interest.

Principle 5: MANAGEMENT

Software engineering managers and leaders shall subscribe to and promote an ethical approach to the management of software development and maintenance . In particular, those managing or leading software engineers shall, as appropriate:

5.01 Ensure good management for any project on which they work, including effective procedures for promotion of quality and reduction of risk.

5.02. Ensure that software engineers are informed of standards before being held to them.

5.03. Ensure that software engineers know the employer's policies and procedures for protecting passwords, files and information that is confidential to the employer or confidential to others.

5.04. Assign work only after taking into account appropriate contributions of education and experience tempered with a desire to further that education and experience.

5.05. Ensure realistic quantitative estimates of cost, scheduling, personnel, quality and outcomes on any project on which they work or propose to work, and provide an uncertainty assessment of these estimates.

5.06. Attract potential software engineers only by full and accurate description of the conditions of employment.

5.07. Offer fair and just remuneration.

5.08. Not unjustly prevent someone from taking a position for which that person is suitably qualified.

5.09. Ensure that there is a fair agreement concerning ownership of any software, processes, research, writing, or other intellectual property to which a software engineer has contributed.

5.10. Provide for due process in hearing charges of violation of an employer's policy or of this Code.

5.11. Not ask a software engineer to do anything inconsistent with this Code.

5.12. Not punish anyone for expressing ethical concerns about a project.

Principle 6: PROFESSION

Software engineers shall advance the integrity and reputation of the profession consistent with the public interest. In particular, software engineers shall, as appropriate:

6.01. Help develop an organizational environment favorable to acting ethically.

6.02. Promote public knowledge of software engineering.

6.03. Extend software engineering knowledge by appropriate participation in professional organizations, meetings and publications.

6.04. Support, as members of a profession, other software engineers striving to follow this Code.

6.05. Not promote their own interest at the expense of the profession, client or employer.

6.06. Obey all laws governing their work, unless, in exceptional circumstances, such compliance is inconsistent with the public interest.

6.07. Be accurate in stating the characteristics of software on which they work, avoiding not only false claims but also claims that might reasonably be supposed to be speculative, vacuous, deceptive, misleading, or doubtful.

6.08. Take responsibility for detecting, correcting, and reporting errors in software and associated documents on which they work.

6.09. Ensure that clients, employers, and supervisors know of the software engineer's commitment to this Code of ethics, and the subsequent ramifications of such commitment.

6.10. Avoid associations with businesses and organizations which are in conflict with this code.

6.11. Recognize that violations of this Code are inconsistent with being a professional software engineer.

6.12. Express concerns to the people involved when significant violations of this Code are detected unless this is impossible, counter-productive, or dangerous.

6.13. Report significant violations of this Code to appropriate authorities when it is clear that consultation with people involved in these significant violations is impossible, counter-productive or dangerous.

Principle 7: COLLEAGUES

Software engineers shall be fair to and supportive of their colleagues. In particular, software engineers shall, as appropriate:

7.01. Encourage colleagues to adhere to this Code.

7.02. Assist colleagues in professional development.

7.03. Credit fully the work of others and refrain from taking undue credit.

7.04. Review the work of others in an objective, candid, and properly-documented way.

7.05. Give a fair hearing to the opinions, concerns, or complaints of a colleague.

7.06. Assist colleagues in being fully aware of current standard work practices including policies and procedures for protecting passwords, files and other confidential information, and security measures in general.

7.07. Not unfairly intervene in the career of any colleague; however, concern for the employer, the client or public interest may compel software engineers, in good faith, to question the competence of a colleague.

7.08. In situations outside of their own areas of competence, call upon the opinions of other professionals who have competence in that area.

Principle 8: SELF

Software engineers shall participate in lifelong learning regarding the practice of their profession and shall promote an ethical approach to the practice of the profession. In particular, software engineers shall continually endeavor to:

8.01. Further their knowledge of developments in the analysis, specification, design, development, maintenance and testing of software and related documents, together with the management of the development process.

8.02. Improve their ability to create safe, reliable, and useful quality software at reasonable cost and within a reasonable time.

8.03. Improve their ability to produce accurate, informative, and well-written documentation.

8.04. Improve their understanding of the software and related documents on which they work and of the environment in which they will be used.

8.05. Improve their knowledge of relevant standards and the law governing the software and related documents on which they work.

8.06 Improve their knowledge of this Code, its interpretation, and its application to their work.

8.07 Not give unfair treatment to anyone because of any irrelevant prejudices.

8.08. Not influence others to undertake any action that involves a breach of this Code.

8.09. Recognize that personal violations of this Code are inconsistent with being a professional software engineer.

This Code was developed by the ACM/IEEE-CS joint task force on Software Engineering Ethics and Professional Practices (SEEPP):

Executive Committee: Donald Gotterbarn (Chair), Keith Miller and Simon Rogerson;

Members: Steve Barber, Peter Barnes, Ilene Burnstein, Michael Davis, Amr El-Kadi, N. Ben Fairweather, Milton Fulghum, N. Jayaram, Tom Jewett, Mark Kanko, Ernie Kallman, Duncan Langford, Joyce Currie Little, Ed Mechler, Manuel J. Norman, Douglas Phillips, Peter Ron Prinzivalli, Patrick Sullivan, John Weckert, Vivian Weil, S. Weisband and Laurie Honour Werth.

Last Update: 09/02/98 by HK