The Requirements of Justice Arising from the 'Digital Divide'

By

Blake L. White

The Strategic Technology Institute, Oakland, CA 94610, USA.
www.strategic-tech.org, 510-839-6447, blake@strategic-tech.org

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Abstract

The persistent social and economic inequities of a poverty-stricken underclass, further stratified by race, continue to be exacerbated by new generations of technology. The gaps in access to, and mastery of, Information & Communications Technologies are often referred to by a political euphemism -- the *digital divide*.' A socio-ethical analysis of how the 'digital divide' affects the African-American poor, as an archetype of the U.S. poor in general, provides an interesting case study of the ethics of technology diffusion. Using principles of *distributive justice* and John Rawls' *Difference Principle*, the 'digital divide' issue can be shown to be more social than technological. However, the race-indifferent application, promotion, and subsidization of this new form of public infrastructure are further compromising the *Civil Rights Act of 1964*, the *Brown v. Board of Education* decision, and the *Voting Rights Act of 1965*. Therefore, distributive compensatory justice in the digital era entails, not just meaningful access to technology, but reparations in human capital development that allow for an equal opportunity to offer value in the marketplace of ideas and make mature informed judgments in a participatory democracy.

Dedication

In memory of Blake Barnabus White (1929-1991), the father who twice gave me life.

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Acknowledgments

This project summarizes 24 years of personal observations on the historical interplay of science and society and on the proper role of technologists influencing modern public policy. As not only a reflection of cultural values, but as an instrument for change, technological capability in a post-industrial, technologically-saturated, information-intensive society requires a more enlightened code of ethics and design principles to improve the well-being and social order of global humanity.

It was developed in conjunction with graduate research performed at Stanford University in California and Xavier University in Ohio, community work with the National Technical Association, the National Black MBA Association, and the Bay Area 100 Black Men, plus a 27 year career in the Information & Communications Technology industry.

I owe deep gratitude to Professor Robert McGinn and to Dr. Ernle W.D. Young, who provided the foundation in ethical principles as they relate to science and technology, and to Associate Dean Linda Paulson for allowing me to use the Stanford MLA Program as a platform for broadening my engineering background with arts and literature. Stanford professors Hans Ulrich Gumbrecht, Ray McDermott, Patrick Hunt, Thomas Sheehan, Jan English-Lueck, Gerald Dorfman, Ramon Saldivar, Richard Terdiman, and Edward Steidle, plus Stan Hedeen and Napoleon Bryant at Xavier provided the critical historical and cultural framework for my analysis. I offer special thanks to John Canada at North Carolina State University for encouraging me to pursue advanced research when I lacked self-confidence.

For lively debate and thought-provoking analysis, I am indebted to: Philip Berry of the National Urban League for introducing me to the work of important futurists in the 1980s; Dr. Alan Letton of the National Technical Association and former Dean of Engineering at Tuskegee Institute; Janet Butler for our innovative work at the National Technical Association in the Cincinnati black community; Dr. Roderick Pettigrew of the National Institutes of Health and Emory University; Gerald Harris of the Global Business Network in Berkeley; Bob Johansen of the Institute for the Future, who encouraged my move to Silicon Valley in 1985; and Senator Gary Hart of Colorado for encouraging me to “fight the good fight.”

In memoriam, I acknowledge the important sociological analyses of the African-American community by Dr. W.E.B. DuBois, the training I received from Dr. Merlin Pope on his *Social Distance Model*, and the indirect influence of Dr. Carl Sagan of Cornell University, whose demystification of science for the masses and his wonderful ability to weave the historical, cultural, and political contexts of scientists and their work profoundly fueled my passion.

Certainly, no words can express the sincere thanks and love I have for: my wife Cheryl, who tolerated my absences and supported my obsession with this subject; my children Jessica, Jason, and Julian, who provide me with the motivation to contribute to an improved world; and to my parents, Blake and Ruth White, who instilled a love for education in my young mind, even when the power of the legal apartheid of 1960s North Carolina seemed insurmountable.

About the Author

Blake White is the Founding Principal of the Strategic Technology Institute (STI). STI is a virtual 'think tank' that investigates the business and public policy issues raised by science and engineering. STI is also a global network of independent technology assessment consultants and public policy futurists that provide advisory services, product marketing consulting, business development services, speakers' bureau, focused research, and custom publishing. Silicon Valley veteran and 'Big 4' consultant, Blake White, founded STI (originally Strategic Technologies and then Strategic Systems Inc. in San Francisco) in 1985.

White's 28 years of technology industry experience includes national leadership of the Digital Media Risk Management Practice of PricewaterhouseCoopers LLP, servicing clients in the film, broadcast, and music industries. He also held the positions of: Vice President of Strategic Services at National TeleConsultants, Vice President of Major Accounts for PublishOne (a start-up online publishing service for business information providers that was acquired by digital rights management leader InterTrust Technologies), Vice President & General Manager of WAM!NET Entertainment, several Director-level positions at Silicon Graphics (SGI) focusing on the Entertainment & Media industry, Director of Corporate Development at Apple Computer, plus management and technical positions in enterprise networking, distributed computing and multivendor IT integration initiatives at Digital Equipment Corporation (DEC), Hewlett-Packard, and Procter & Gamble's Management Systems Division.

White authored **The Technology Assessment Process: A Strategic Framework for Managing Technical Innovation**, published by Greenwood Press in 1988, and he was the principal author of the PricewaterhouseCoopers 2003 publication -- **A New Era for Content: Protection, Potential, and Profit in the Digital World** -- and the **SMPTE Motion Imaging Journal** article (April 2004) by the same name. He co-authored *Digital Asset Management: Process Over Product*, published in **Broadcast Engineering** (July 2004). White also published several articles for the **Journal of the National Technical Association** and has been active on the lecture circuit for two decades at events sponsored by university and community organizations that ranged from technical literacy, to space industrialization, energy alternatives, social implications of new technologies, information privacy, the history of science and technology, and ethical debates.

Professional memberships include: The Association for Computing Machinery (ACM), the Institute of Industrial Engineers (IIE), and the Society of Motion Picture and Television Engineers (SMPTE). A sample of White's speaking engagements include: the Cannes Film Festival, SMPTE Technical Conference, International Broadcast Conference (IBC), National Association of Broadcasters (NAB), Digital Hollywood, Showbiz Expo, Broadcast South Africa, EnterTech, Digivations 2003, AGLSP 2004 (Association of Graduate Liberal Studies Programs), and he presented the feasibility of military base conversion to film studio facilities to the late-Honorable Ron Brown, U.S. Secretary of Commerce, and to former Vice President Al Gore's staff.

Community activities include: Board Member of the National Technical Association, the National Black MBA Association, the Bay Area 100 Black Men, the Cincinnati Environmental Advisory Council, the Cabarrus County Chapter of the North Carolina Human Relations Commission.

White holds an engineering degree from North Carolina State University, an MBA from Xavier University (Ohio), and is a candidate for the MLA degree at Stanford University.

Preface

Holistic Self-Development of a Silicon Valley Geek

The historical development and social implications of science and technology remain my passion. However, my adult life has been consumed with overly analytical and stressful attempts to win in the high-tech market in order to provide a better life for my family. So, there has not been much spare time to pursue my passion. In order to achieve a better life-work balance and pursue my intellectual interest, *STI* provides a framework for my colleagues and I to develop a more holistic worldview, especially as it relates to science, technology and society.

Through technology, I have earned a decent living. However, my life has been a constant search for a breadth of cultural experiences to counterbalance and complement the sterility of Silicon Valley. As such, my business and personal travels have allowed me to see and experience the world, as few others having grown up in a small North Carolina mill town would conceive.

I have seen the sun set over Mount Fuji in Japan, been amazed at how close the DMZ is to millions of people in Seoul, marveled at the artistry of wood carvers and back street "jewelry" runners in Hong Kong, stood in awe of the architecture of the Sydney Opera House, and was amazed at how openly a Sydney cab driver casually made racist remarks about Australia's indigenous people. My wife and I were invited by NASA to witness the first night launch of the Space Shuttle, which also lifted Guy Bluford, the first Africa-American astronaut, into space. We flew in a helicopter to the top of a Hawaiian volcano and then under a rain forest's waterfall, experienced brutally freezing temperatures on a glacier outside Banff, drove through the majestic Alps on the Napoleon Highway, and bathed in the warmth of the Caribbean people. I sat with those with great wealth in Monaco and saw first-hand the gulf between the misery of the poor in Mexico City and the indulgences of their elite counterparts. History has come alive and my perspective has been broadened by walking the tower steps of Notre Dame, being outraged at the grave robbers who, in the name of science, transported so much Egyptian art and even mummies to the Musée du Louvre. While staring at the clothes and weapons in the lower levels of Westminster Abbey, for the first time, I really understood just how long the British Royal family has been in power. I have enjoyed standing by the Fjord in Norway where Vikings once sailed. I struggled to understand the dichotomy between the conservative Dutch who are equally comfortable with a multiethnic population, public drug dealing, legal prostitution, and euthanasia. I felt a chill as I landed at the same Berlin airstrip that I saw in old newsreels of Adolf Hitler. I was struck by how I could simultaneously feel reverence and horror in my every nerve, as I stood in Nelson Mandela's prison cell on Robben Island. These have been wonderful life experiences rare to most of the world.

My work has allowed me to advise business and world leaders, such as John Sculley at Apple, Ed McCracken at SGI, Senator Gary Hart of Colorado, the late Secretary of Commerce Ron Brown, and Vice President Al Gore's staff. I have met President Jerry Rawlings of Ghana, former California Governors Jerry Brown and Pete Wilson, Reverend Jessie Jackson, Kwame Toure (Stokely Carmichael), former head of the Urban League Vernon Jordan, the first African-American woman astronaut, Dr. Mae Jemison, presented controversial recommendations on the uses of technology in public education to the Congressional Black Caucus, and twice hosted a delegation of the British Counsel General and his trade ministers.

I have seen the superficiality of the image industry at the Cannes Film Festival, was honored to share with my daughter a preview of the re-release of *Star Wars* in George Lucas' private theater, was treated to a preview of Michael Jackson's unreleased *History* CD by the artist himself in his private LA studio, and attended the opening of the only U.S. movie studio owned by African Americans – Tim and Daphne Reid's *New Millennium Studio* outside Richmond Virginia. Along the way, my wife and I have had the pleasure of witnessing giants in the arts, such as Ella Fitzgerald, Cab Calloway and Miles Davis. We saw ourselves change from fans to critics of Joan Miro as we examined a more extensive body of his work.

This is not bad for a kid from the other side of the tracks, whose mother and father had constrained opportunities of the segregated Jim Crow South. The same black kid who cowered under the window sill as the Ku Klux Klan burned a cross on the neighbor's lawn and shot bullets through their windows has experienced and influenced more of the world than those small-town extremists will ever know.

Along this fascinating journey, I have seen life's grim inequities and its glorious potential. Likewise, I have seen technology – which is always devoted to a specific aim – amplify inequities while making the impossible possible. While the quickening pace of scientific knowledge and its direct (and sometimes unintentional) impact have fascinated me since I followed the Gemini and Apollo missions in my youth. My adult career as an engineer and my community activism reinforced a belief that *science* can, theoretically, be neutral, but *technology* is never neutral.

Since technology is the use of scientific knowledge toward a defined set of goals, it always has social implications. In the profit-oriented zero sum game of global capitalism, the winners often use technology to redefine the rules of society in their favor. We have seen nineteenth and twentieth century industrialists redefine wealth and power according to the ownership of machines and the means of production. Today, we are in the throes of an economy that defines success by the ownership and control of information and the tools that access and exploit abstract representations of knowledge. The losers suffer either profound dislocations, an increasing economic gap with its subsequent competitive disadvantages, or at best they become the employees or servants of the new ruling class. Witness the industrial age that attracted or forced waves of agricultural workers to abandon the fields in favor of centralized factories and witness again today's debates on the "digital divide."

Even beyond the market-oriented implications of technology, there have historically been tension, and sometimes persecution, between the discoverers of knowledge and the high priests of the dominant belief system. The burning of the Library of Alexandria by church-directed Crusaders, the inquisition of Galileo, the Scopes evolution trial, railings against NASA by rural and inner city evangelists in the '60s and '70s, and the recent uproar over stem cell research are only examples of a long history of suspicion and fear between the religious and scientific communities. The nature of this tension goes beyond the mere challenge of paradigms. While scientific knowledge can be a challenge to the paradigm, the real threat is based on the potential use of knowledge via technology to undermine and unseat the center of power. That is why the paradigm holders are often the first to co-opt the new technology for their own use. For example, reading and writing were once restricted to royal scribes, high priests and Medieval monks. Today, successful radio and television evangelists ironically rail against the same "evil media" that is "corrupting our youth." New technologies for the masses seem to be evil, until they are adopted by the powerful for their own purposes.

In either case – markets or faith – if anyone is to be adversely impacted by a new technology, it is generally the poor, the powerless, and those of color.

Through the intellectual stimulation of like minds, I hope to use these life experiences and my observations of the lives of others to understand the duality of existence and create a more holistic "end" to the technological "means" that so often dominate life. At a minimum, I will enter the next stage of my life as well rounded, socially aware, and culturally sensitive. If done right, my colleagues and I might catalyze a whole new approach to technology assessment -- one that considers context and condition on a par with discovery and tools.

Understanding the history, belief systems, ethics, shared assumptions found in the literature and history of the period, economic shifts, political context, class/race struggles, and the critical adoption rate or "tipping point" associated with major scientific discoveries and their related technological uses, will allow us to develop an approach to technology assessment that is balanced with a humanist worldview. This art form can be inherently superior to the sterile analysis of trends typically used by scientists, technologists, economists, and pundits in general. It will take into consideration the untidy emotional and cultural factors inherent in the "ends" that justify the technological "means." In the process, we will be able to minimize the over-exaggerated differences between technology and ethics, culture and tools.

We may even be able to usher in a new age of complementary thinking styles based on harmony between science and religion, tangible and intangible, fact and faith, optimism and fate.

I invite you to join the journey.

B. L. White
Oakland, California
March 16, 2006

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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

Chapter One

Introduction: 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

A socio-ethical analysis of how the 'digital divide' affects African-Americans provides an interesting case study of the ethics of technology diffusion, when the technology in question is promoted and subsidized by public institutions as a new form of public infrastructure. The 'digital divide' is a political euphemism used within the United States over the past twenty years, and among the United Nations, the World Bank, and non-governmental agencies within the past decade, that describes the technology gap that falls along the lines of race and class. This project asserts that distributive compensatory justice for African-Americans in the digital era entails fulfillment of a set of requirements for, not just meaningful access to the new digital infrastructure, but reparations *in human capital development* that would allow for an equal opportunity to fully participate in the economic, educational, and political life, the inequities of which continue to be exacerbated by new generations of technology. As a working definition, this project adopts the perspective of human capital development espoused by Anthony Wilhelm, who led the 'Digital Nation' initiative for the U.S. Commerce Department's National Telecommunications and Information Administration. He suggests that human capital development has 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).

Why Focus on African-Americans?

A valid question might be asked by the relatively comfortable, middle and upper class, educated, either 'politically-correct' or neo-conservatively 'color-blind' citizen of a twenty-first century representative democracy that is the United States: why the focus on African-Americans? After all, is not racism passé? With the progress of the black educated upper-middle class in corporations, such as Chief Executive Officer Kenneth Chenault of American's Express, Chairman Richard Parsons of Time Warner, Chairman & CEO John Thompson of computer security company Symantec, or the technical achievements by founding engineer Marc Hannah of Silicon Graphics, or those of astronauts Guy Bluford, Charles Bolden, the late Dr. Ronald McNair, and Dr. Mae Jemison, or the visible political success of the last two holders of the Secretary of State office, General Colin Powell and Dr. Condoleezza Rice, not to mention the bully pulpit of entertainment moguls Oprah Winfrey, Bill Cosby, and Russell Simmons, surely African-Americans now have an equal opportunity at achieving the American success story?

The individual successes of specific African-Americans, whose positive attributes are individualized but rarely generalized across the broader racially stigmatized and economically-challenged population of blacks in the U.S., can comfortably allow the middle and upper classes of all races in the U.S. – blacks included – to forget that a large underclass exists in twenty-first century America, and that caste has historically been and continues to be stratified by race.[1] As President

[1] According to Glenn Loury, racial stigma is a cultural artifact, more than an artifact of racial markings, as it relates to blacks' opportunities for success. "The unfair treatment of persons based on race in formal economic transactions is no longer the most significant barrier to the full participation of blacks in American life. More important is the fact that too many African-Americans cannot gain access on anything approaching equal terms to social resources that are essential for human

Harry Truman reminded the nation in the preamble to *Executive Order 9981* in 1948, "We cannot properly understand the American civil rights record without giving attention to the composition of the American people" (Wright 522).

In 2004, 37 million people were in poverty in the U.S., up 1.1 million from 2003[2] (U.S. Census Bureau: *Income, Poverty, and Health Insurance Coverage in the United States, 2004*). The poorest ten percent of people in the U.S. receive only 1.9 percent of the country's income, just ahead of China's 1.8 percent, and straggling behind the United Kingdom, Italy, France, Germany, and Japan, whose poorest ten percent receive 2.1, 2.3, 2.8, 3,2, and 4.8 percent of the country's income, respectively.[3] Blacks comprise 12.3 percent of the population, but 24.9 percent of America's poor (The Urban Institute using 2000 U.S. Census data).

Skeptics and detractors need only be reminded of the 'invisible' masses of blacks that suddenly flashed across television screens during the 2005 Hurricane Katrina disaster. People too poor, too sick, or too sick and poor to flee the path of a Category 5 hurricane seemed to surprise most Americans. Without cars, money for gasoline, or credit cards, and for those on public assistance who were caught at the end of the month before the government check arrived, there was no place to go. They faced disaster and death of biblical proportions.

The government, embarrassed that its free market color-blind policies had been exposed to a global television audience, neglected to remind the country that these invisible poverty-stricken citizens accounted for 27.9 percent of New Orleans' residents. While the poor population of New Orleans certainly includes more that black people – 11.5 percent of the city's 28.1 percent of whites also lived in poverty – of the 67.3 percent black population of New Orleans, 35 percent lived in poverty. This problem also remains more widespread than New Orleans. Cities of comparable size – Cleveland, Las Vegas, and Oklahoma City – had black poverty rates of 33.8, 23.7, and 29.9 percentage points, respectively. The problem of African-American poverty exists in Atlanta, Baton Rouge, Dallas, Houston, Jackson, Little Rock, San Antonio, and Shreveport, for example. The black poverty rates in these cities range from 21.7 to 36 percent. (The Urban Institute using 2000 U.S. Census data).

This project assumes that African-Americans serve as a racially identifiable proxy for the general socio-economic case of other U.S. minorities and that by examining the structural impediments of the chronically poor segment of the black community, it may be easier to understand the less obvious structures that impede the American poor in general. As Harvard's Glenn Loury argues, responsibility for these socio-economic inequities rests with either: (a) external society, (b) internal group expectations and motivations, (c) innate inferiority at performing a task, or (d) some combination of these factors (Lowry 162-163). In a modern democracy, the concept of innate inferiority is assumed false, so "a" and "b" are responsible for solving the problem in a socially just way (Lowry 162-166).

Unlike other, more recent immigrants, the influence of a foreign social and economic system cannot be the reason for poor blacks' continued position on the bottom rung of the socio-economic ladder. As Loury observes, African-Americans comprise a group whose history has been largely determined within the confines of the U.S. social system. So whether the inequality in economic opportunity resulted from the historical actions of a hostile or indifferent American society, or whether it is due to the pathological actions of those within the group, the resulting inequities have occurred under the influence of the peculiar relationship of social behavior, customs, expectations, laws, and self-fulfilling prophesies that have a particular American character. In addition, blacks have been disproportionately harmed by their starting position in a number of critical technologies from their enslavement by superior military technology, to their role 'feeding the machine' of King Cotton, to their late arrival to the industries of the North (McGinn, Science 118-121). Now a relatively large percentage of the group risks further marginalization due to the requirements of a technologically-

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flourishing, but that are made available to individuals primarily through informal, culturally mediated, race-influenced social intercourse" (168).

[2] The U.S. government's official poverty line is set at $19,300 per year for a family of four, or $9,800 per year for an individual under 65. 2004's overall rate of poverty was 12.7 percent (WashingtonPost.com, and Newsweek interactive chart on 21 September 2005).

[3] Newsweek interactive chart on 21 September 2005.

intensive global information economy. Failure of society to intervene in this vicious cycle of technological backwardness is immoral, and in some cases illegal.

Technology the Savior?

Technology creates opportunities and threats to the established social order, including the assumptions and conditions under which rights within the cultural-environmental system have been granted.[4] 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 to engineer collective opportunity. Both tremendous economic opportunity and societal realignment have 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 & Communications Technologies, generally referred to by the acronym ICTs.[5]

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.[6] 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 …is the extreme danger, and if there is truth in Hölderlin's words, then …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.[7] Likewise, José Ortega y Gasset (1883-1955) reminded us

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[4] 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 (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.

[5] For brevity, this book uses ICT as the accepted acronym to describe Information & Communications Technology. It is regularly used by global governmental and non-governmental (NGO) agencies when referring to computer-based systems, information digitally stored in electronic databases, and high-speed telecommunications networks for telephone services and Internet access. Unless otherwise stated or implied by usage, such as other classes of mechanical technology, this book refers to ICT when it uses the term 'technology.'

[6] 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).

[7] 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

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 advised, "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" (103). Since technology amplifies human abilities 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.

Ethical Principles Provide a Framework for Analyzing the 'Digital Divide'

The entrance of a new scientific or technological development onto the social scene typically enables new behavioral or intellectual possibilities for its users or adopters. It also poses new intellectual behavioral requirements for effective use of the technology and it may effectively disable certain old behavioral and intellectual options. These changes may be in tension with elements of the cultural-environmental system, and if this tension is significant and persistent enough, the cultural-environmental system may be thrown into disequilibrium. The cultural-environmental system may reject the development or transform itself so as to accommodate the development with which it has been confronted (McGinn, Science 97).

As with most debates over the impact of new technologies on the social structure and on 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. As a framework, this project uses the late twentieth century principles of John Rawls (1921-2002), which are based in part on the nineteenth century progressive utilitarian works of the British philosopher John Stuart Mill (1806-1873).

Principles of *distributive justice* are normative principles designed to allocate goods in limited supply relative to demand. They 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 (Lamont, Stanford Encyclopedia of Philosophy). As society forges technology according to its needs and desires, technology may indeed force one to reevaluate the meaning of *usefulness* implied by utilitarianism, *equality* inferred by distributive justice, and *diversity*[8] at the core of Rawls' *Difference Principle*. 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, for example, a 'preference utilitarian' would choose to distribute benefits that maximize the arithmetic sum of all satisfied preferences, weighted for the intensity of those preferences (Lamont, Stanford Encyclopedia of Philosophy). 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.[9] 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 (Lamont, Stanford Encyclopedia of Philosophy).

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 proposed two principles of justice. First, 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.

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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).

[8] 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).

[9] 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.)

Second, 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 former principle implies that it is irrelevant to give one a right that the recipient is unable to take advantage of. The latter condition espoused by Rawls has come to be referred to as the 'Difference Principle.'

The main moral motivation for the Difference Principle is similar to that for strict equality -- equal respect for persons. Rawls was not opposed to the principle of strict equality per se; his concern was 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 (Lamont, Stanford Encyclopedia of Philosophy).

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* and what is a *fair allocation of resources* in the digital realm. 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 (Lamont, Stanford Encyclopedia of Philosophy). In 1981, Ronald Dworkin proposed that a fair material distribution might give everyone the same purchasing power, such that each might 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 (Lamont, Stanford Encyclopedia of Philosophy).

As one considers 'fair distribution,' one must also examine distribution that is guaranteed in the form of *rights*. Moral rights are held to exist prior to, or independently of, any legal or institutional rules and are entitlements of all members of a group by virtue of the fact that each group member has a certain status. For example, modern Western thinkers proclaim life and liberty as moral rights that all humans have equally by virtue of their status as human beings. Moral rights based on human status are called human rights. All human rights are moral rights, but not all moral rights are human rights (McGinn, *Engineer's Moral Right* 222). When it comes to ICT, it is instructive to ask if fundamental *moral rights* guaranteed in the non-digital world effectively transfer to the same or related moral rights in the digital realm, especially if the bearers of those rights have no practical ability to avail themselves of the means to attain their benefits.

The Digital Divide in the Context of Ethics

Using the ethics of distributive justice and the Difference Principle, a socio-ethical analysis of how the 'digital divide' affects African-Americans enables a valuable examination of the moral rights owed African-Americans and the moral obligations that African-Americans owe to society. The pervasiveness of computer-based technologies 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 and highly visible social activists.[10] 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 Information & Communication Technologies by suburban families and wealthier school districts brought even more attention to the inequalities of

[10] 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).

Internet access by poor inner city and rural populations.[11] 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 U.S. 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 U.S. households had a personal computer with a modem in 1994.[12] More recently, 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, 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 U.S. households, but that 24.7 percent of rural households, compared to 40.4 percent of urban households, had broadband or other high-speed connections. The study also found that minority U.S. residents had even lower adoption rates, with 14 percent of black and 13 percent of Latino households having broadband.

When one considers the digital divide in the context of Mill's concerns, one recognizes that, in a technologically-intensive society, there may be a profound unfairness when it comes to economic development opportunity. Anthony Wilhelm 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).

In modern society, 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 résumés. 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. See Note I for further discussion of the global implications of digital divide policies.[i]

Progressives, such as former President Clinton, and 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.

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[11] The growth of the U.S. 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 high-technology stock speculation bubble.

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

Alternatively, if access is not denied, but is provided in a laissez faire manner as a function of normal technology diffusion, would that adequately address the technology gap? Free market proponents, such as the Cato Institute and the current Bush Administration, 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. So, to this group, the divide is closing and it would be unethical to favor one group over others.

Do rights recognized in the non-digital world automatically transfer to the same rights in the digital realm? When it comes to the provision of government services and the subsidization or promotion of private services over what has become a public infrastructure, the answer is yes. In the modern, technologically-intensive, democratic society of the United States, equal rights to access and use the public infrastructure is assured to all citizens. Title II Section 201 of the *Civil Rights Act of 1964* requires that all persons be entitled to equal enjoyment of the public goods, services, facilities, and accommodations without discrimination on the basis of race, color, religion, or national origin (Wright 589). While the Civil Rights Act was meant to address public transportation, lunch counters, hotels, and theatres, the public market for goods and services, as well as the provision of government services, is increasingly based on computerized access to information available over the network infrastructure of the Internet.

The provision of public infrastructure, such as electricity, has been seen as a public good that should be available to all since President Franklin Roosevelt's *Executive Order 7037* that established the Rural Electrification Administration in 1935. The current administrator of that order, the Rural Utilities Service of the Department of Agriculture, requires that all electric and telecommunications service providers adhere to Title VI of the *Civil Rights Act of 1964*, Section 504 of the *Rehabilitation Act of 1973*, and the *Age Discrimination Act of 1975* (Anderson, C. 1). Going beyond non-discrimination, the U.S. government sees inherent benefit to making communications infrastructure available to all and it is willing to subsidize or mandate special programs for the poor. For instance, the *Universal Service* requirements of the *Telecommunications Act of 1996* mandated a 'Lifeline Assistance Program' to mitigate the cost of monthly telephone bills for qualifying low-income consumers (National Telecommunications and Information Administration, *The New Universal Service*). The *Universal Declaration of Human Rights*, originally adopted by the United Nations in 1948, also acknowledges the fundamental importance of and rights to communications and information access. It asserts that 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). The cumulative effect of these laws and policies is to legitimize the global Information & Communications Technology, when used for the public provision and delivery of services, as a new type of public infrastructure to which all citizens have a right to access and use.

As a result, society has to determine to what extent market forces should be allowed to create an unfair distribution of benefits when the digital divide is not just a case of technology diffusion. Rather, it is a profound change in the social and economic foundation for global society, and therefore, each person has a right of access to and use of basic communications and educational infrastructure.

Rights to infrastructure notwithstanding, surely, one cannot suggest that African-Americans are owed a personal computer and an Internet connection? 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.[13] Of course, the solution is not that simple. In a Rawlsian society,

[13] 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. 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).

everyone must be given a genuine opportunity to acquire membership in the group that enjoys special benefits (Munson 22-23). In the U.S., 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 that requires a certain level of technical sophistication for one to be an active and successful participant. Effective use of ICT is fundamentally different in its skill set requirements than providing access to lunch counters, buses, hotel rooms, restaurants, and theatres, which require no specialized training. Giving the poor the right to use ICT infrastructure, yet neglecting to establish the conditions for effective use of that infrastructure is tantamount to denying access to it. A prerequisite to compensatory justice demands that African-Americans have a moral right to *human capital development* appropriate for the new challenges and opportunities that Information & Communications Technologies present. Given the structural changes going on in the global economy -- changes which benefit highly-educated, flexible, entrepreneurs -- the most important aspects of human capital development initiatives will likely be ones that gets serious about upgrading literacy, logical thinking, mathematical skills, research, and entrepreneurship demanded by twenty-first century educational and economic systems for both children and adults. Only then will computer-based tools be relevant to the day-to-day needs of the poor.

The moral argument should not be restricted only to the distribution of computers and their requisite training, but it needs to be expanded to address the distribution of *relevant benefits*. 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. African-Americans can reasonably claim a need for redress for certain legal rights that are being violated by the societal promotion, provision, and subsidization of ICTs as public infrastructure, in cases where it dramatically exacerbates socio-economic and political inequities. In the U.S., social justice advocates who seek to close the digital divide's unintended negative consequences need to look no further than seminal civil rights laws and milestone cases. Well-intentioned government programs that utilize ICT to provide services can miss their target audience and further compromise long-cherished civil rights. For fair access to jobs and public services, *The Civil Rights Act of 1964* is referenced. *Brown v. Board of Education* helps shape educational access arguments. *The Voting Rights Act of 1965* is being used to prevent digital disenfranchisement (Wilhelm 61). As a matter of Rawlsian fairness, policymakers must ensure that if anyone is to be negatively affected by the unequal distribution of technology, the greatest share of benefits will accrue to the currently most negatively affected groups. Its is morally wrong and short-sighted to address these issues in any other manner than via a comprehensive racially-sensitive strategy.

Relevant distributive justice, as a form of utilitarian ethics, combined with Rawls' Difference Principle 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. However, as summarized here, issues of distributive justice can too often 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). As such, access to technology is a far too simplistic representation of what may actually be occurring in the global society.

Project Goals

This project examines Wilhelm's contention that the digital divide issue is more social than technological, and therefore, certain moral rights are being further compromised by the way in which Information & Communications Technologies are being allowed to exacerbate the existing socio-economic and political inequities in the United States.[14] In the process, its will explain how the digital

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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 (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).

[14] When one looks at the global digital divide from the African-American community's perspective, there may also be lessons from Asian public policy decisions regarding the successful investment and diffusion of ICT that bear striking similarities to the resolution of a 100-year old debate between the W.E.B. 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

divide, as a political issue, is not digital. The discussion of computers and the Internet, though important, are insufficient and serve as a smokescreen for the real systemic underlying structural issues of class, race, advantage, and disadvantage. Since the actual divide is structural, it will also discuss how computer-based solutions do not solve the problem. In fact, it will look at examples of how technology thrown at social problems tends to exacerbate the inherent social and economic inequities.

This project seeks the means by which ICT's application as the modern infrastructure for business, education, and delivery of governmental services might support a more just distribution of relevant public services. It seeks to *justify* information technology, not in the popular use of the term, which alludes to making excuses; rather, we seek to identify how the actions of computer scientists and engineers involved in the development of public infrastructure may be *facere justus*, i.e., made lawful, right, or fair. Likewise, the project examines how recipients of public outreach and reparations programs have a commensurate moral obligation to take advantage of the programmatic opportunities put forth by society to redress past and current inequities.

resolved by either DuBois' academically-trained and ethical *Talented Tenth* or Washington's vocationally-trained craftsmen is being challenged in India and China. These are referred to, as appropriate, in the book, but are treated in more detail in Note I. 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

The Real 'Digital Divide' is not Digital

To what purpose should I trouble myself searching out the secrets of the stars, having death and slavery continually before my eyes?

-- Anaximenes (600 BCE)

Art and music to people who live in rented houses and with no bank account are not the most important subjects to which attention can be given. Such education creates wants without a corresponding ability to supply these increased wants.

-- Booker T. Washington

Equality as a Promise; Inequality as a Fact

The 'digital divide' is not digital. The extensive public discussion of computers and the Internet among politicians and various advocacy groups masks the real systemic underlying structural issues of class, race, advantage, and disadvantage.

One of the critical structural factors contributing to a group's likely success in leveraging a new technology for its socio-economic advantage is its relative starting condition when the technology in question is introduced to the group[15] (McGinn, Science 96-97). For example, warfare technologies of the sixteenth through the nineteenth centuries contributed to the capture of Africans for the Atlantic slave trade. Jared Diamond suggests that the differences between the socio-economic development of European and African people had much to do with accidents of geography and biogeography. Arable land, wild plants and animal species, and the spread of technology influenced the continents' historical trajectories (Diamond 400-401).

> Africa's major axis is north-south, whereas Eurasia's is east-west. As one moves along a north-south axis, one traverses zones differing greatly in climate, habitat, rainfall, day length, and diseases of crops and livestock. Hence the crops and animals domesticated or acquired in one part of Africa had great difficulty in moving to other parts. Food production was delayed in sub-Saharan Africa, compared to Eurasia, by Africa's paucity of domesticable native animal and plant species. Africa's earliest agriculture may have begun several thousand years later than that of the Fertile Crescent. Domestic animals did not reach sub-Saharan Africa until thousands of years after they began to be utilized by emerging Eurasian civilizations (Diamond 398-399).

According to Diamond, "Crops and animals moved easily between Eurasian societies thousands of miles apart but at the same latitude and sharing similar climates and day lengths." Eurasia's native cows, sheep, goats, horses, and pigs were among the few large animals that were sufficiently docile, submissive to humans, cheap to feed, immune to diseases, grow rapidly, and breed well in captivity. The African equivalents, such as buffalo, zebra, bush pig, rhino, and hippopotamus, have never been domesticated. While horses had reached Egypt by 1800 BC, they did not cross the Sahara to western African kingdoms until the first millennium AD, and they never

[15] As a generalization, social change is a joint product of the technical change in question and the 'initial social conditions' under which the technical change is introduced (McGinn, Science 96).

spread south though the tsetse fly zone. "Thus, as far as plant and animal domestication was concerned, the head start and high diversity lay in Eurasia, not with Africa," notes Diamond (399).

Where cavalry transformed North African warfare, West African kingdoms were delayed in their adoption of horses. Likewise, pottery found in the Sudan and Sahara around 800 BC, did not reach the Cape until approximately 1 AD. Writing developed in Egypt by 3000 BC and spread to the Nubian kingdom of Meroe and Ethiopia, but writing did not rise independently in other parts of Africa but was brought in by Arabs and Europeans (Diamond 400). So, due to the geographical and biogeographical aspects of the African continent, when Europeans arrived in west and southern Africa they had what Diamond describes as, "…a triple advantage of guns and other technology, widespread literacy, and the political organization necessary to sustain expensive programs of exploration and conquest" (Diamond 398).

The use of slaves in medieval Europe and in Africa for household work drastically changed with the discovery of the Americas. Mining and plantations required hard work and skilled labor. The Portuguese and Spanish soldiers and settlers started by enslaving the 'Indians' with dismal results. When Hispanola was discovered, it was estimated by Spanish officials to have had 1.1 million 'Indians.' By 1518, that number was estimated at 11,000 (Davidson 207). With European slaves in short supply and with American 'Indians' unsuitable, the Spanish crown legalized African slavery in 1510. By 1800, half the population of Brazil was of African origin (Davidson 218). The trans-Atlantic slave trade endured for three and a half centuries and delivered ten to twelve million Africans to the Americas (Davidson 207-208).

Slavery, as practiced in the United States, was insidious. Unlike earlier slaveholding societies of ancient Europe or even the indigenous slavery of Africa, American slavery was a legal institution that established the slave's status for life. As early as 1664, the Maryland General Assembly passed a law that mandated that all Africans coming to Maryland in the future would be slaves and it grandfathered those already in the colony to lifelong slavery (Wright 7). The South Carolina Colony decreed "Every Freeman of Carolina shall have absolute power and authority over Negro Slaves of what opinion or Religion soever…" (Wright 15). So, even religious conversion would not free a slave in South Carolina.

The cotton gin further drove the need for the importation of more slaves to pick cotton. Eli Whitney's gin (1793) removed the seeds from the cotton boll so easily that short-staple cotton, which was the only type of cotton that could be grown far inland in America, became a very profitable cash crop. Human cultivation became the bottleneck in the production process, rather than the removal of seeds. A seemingly unlimited demand for cotton products demanded more human labor for cultivation. Between 1790 and 1810 the output of raw cotton in the United States rose from 1.5 million to 85 million pounds. By the Civil War in 1861, U.S. slave plantations were satisfying 83 percent of an increasing worldwide demand for cotton (Derry 557). The reign of 'King Cotton' arrived in the American south.

During this period of enslavement, the forced, unpaid, servile caste of blacks was held in ignorance. As economist Thomas Sowell observes, "Literacy would have permitted slaves to become more valuable to slave owners by the increased range of work they could have performed, but it would also have given the slaves access to pictures of the possibilities and meaning of freedom, as well as increased chances of achieving it. Even if some particular slave owner might find it unnecessary, or not cost-effective, to keep his own slaves illiterate, the ease with which literacy can be spread would have meant large external costs to other slave owners and to slavery as a system if literacy became widespread among a slave population which engaged in inter-plantation visits" (85). Therefore, South Carolina became the first of many states to prohibit teaching slaves to write (Wright 38).

> Be it therefore enacted…that all and every person and persons whatsoever, who shall hereafter teach, or cause any slave or slaves to be taught, to write, or shall hereafter shall use or employ any slave as a scribe in any manner of writing whatsoever, hereafter taught to write, every such person and persons, shall, for every such offence, forfeit the sum of one hundred pounds current money.

Because slavery demanded ignorance, it reduced the incentive to escape as well as the means, as Sowell notes. In addition, it limited the kinds of work that slaves could perform. Slaves were not used

in tasks requiring wide dispersion, extensive travel, firearms, or control of large sums of money (Sowell 84-85).

In spite of President Abraham Lincoln's *Emancipation Proclamation*, which freed the slaves in the South as a war order, the status of slaves nationwide remained unchanged until the *13th Amendment* was passed on January 31, 1865 (Wright 342).

> Section 1. Neither slavery nor involuntary servitude, except as punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction.
>
> Section 2. Congress shall have the power to enforce this article by appropriate legislation.

Although the slaves were free, that did not mean they were citizens. The *Civil Rights Act of 1866* established their citizenship (Wright 385).

> *Be it enacted*, That all persons born in the United States and not subject to any foreign power, excluding Indians not taxed, are hereby declared to be citizens of the United States; and such citizens of every race and color, without regards to any previous condition of slavery or involuntary servitude, except as punishment for a crime whereof the party shall have been duly convicted, shall have the same right, in every State and Territory in the United States, to make and enforce contracts, to sue, be parties, and give evidence, to inherit, purchase, lease, sell, hold, and convey real and personal property, and to full and equal benefit of the laws and proceedings for the security of person and property, as is enjoyed by white citizens, and shall be subject to like punishment, pains, and penalties, and to none other, any law, statute, ordinance, regulation, or custom, to the contrary notwithstanding.

Even though they were legally free, the long-term effects of slavery and ignorance brought social costs for the ex-slaves and for society at large. Thomas Sowell explains, "Where a population is kept ignorant and psychologically repressed, and then emancipated, their later performance as free workers and members of society may continue to cost the rest of the society directly (in increased public expenditures) or indirectly (in handicapped economic performance)" (88). He goes on to note that, "Given the enormous racial difference in initial wealth and – perhaps even more important – in human capital immediately after the Civil War, even with an ideally non-discriminating government, it would have taken unprecedented achievements for blacks to have closed the gap in a few generations – especially since white income was growing all the while" (114).

The political institution of slavery, which enabled the economic institution of the antebellum cotton plantation, was replaced by sharecropping. The political institution that paralleled sharecropping was segregation. From the Emancipation onward, blacks in the South were denied social equality and legal rights, even though they were United States citizens. According to Nicholas Lemann, "Segregation strengthened the grip of the sharecropper system by ensuring that most blacks would have no arena of opportunity in life except the cotton fields" (Lemann 6).

However, mechanized agribusiness eliminated the need for large-scale manual labor in agriculture and therefore displaced sharecroppers into a foreign industrial system. From 1927 until 1944, International Harvester field-tested cotton-picking equipment on the Hopson plantation outside Clarksdale, Mississippi. On October 2, 1944, the first production-ready mechanical cotton picker demonstrated that cotton planters no longer needed large numbers of black people to pick cotton. Hopson's accounting showed that picking a bale of cotton with the machine costs him $5.26 versus the $39.41 it costs to pick by hand. Each machine did the work of 50 people (Lemann 3-5).

In 1940, 77 percent of African-Americans lived in the South, with 49 percent living in the rural South. Between 1910 and 1970, 6.5 million blacks moved from the southern countryside to cities in the South, West, and North; five million of them moved after 1940 (Lemann 6). Blacks once again had to leave their social and economic base and find a new one. When blacks migrated to the city, as Thomas Sowell reminds us, "…like many other unacculturated elements from other ethnic groups, they became disproportionately represented among paupers, vagrants, and criminals" (72). For America, no longer was race purely a Southern issue. As Lemann observes:

> The South, and only the South, had to contend with the contradiction between the national creed of democracy and the local reality of a caste system. The

> great black migration made race a national issue in the second half of the century – an integral part of the politics, the social thought, and the organization of ordinary life in the United States. Race relations stood out nearly everywhere as the one thing most plainly wrong in America, the flawed portion of the greater tableau, the chief generator of doubt about how essentially noble the whole national enterprise really was (7).

For those blacks that sought entry to and advancement within the industrial sector, the *Wagner Act of 1935* mandated recognition of the existing employee unions, giving incumbent workers the power to exclude other workers. As Sowell observes, "With the rise of government supported labor unions having complete dominance over particular occupations – notably in the railroads and construction trades – union membership was tantamount to occupational licensing, and was used to keep out (or drive out) blacks" (110).

By the end of the migration in 1970, black America was half Southern and less than 25 percent rural. Lemann notes, 'urban' had become a euphemism for 'black.' "The black migration was one of the largest and most rapid mass internal movements of people in history – perhaps the greatest not caused by immediate threat of execution or starvation. In sheer numbers it outranks the migration of any other ethnic group – Italians or Irish or Jews or Poles – to this country" (6).

Globalization of manufacturing negatively impacted the black community of industrial workers at a time when they had just begun to attain unionized industrial positions. For example, the Bureau of Labor Statistics showed that in 1999, 44.1 percent of black men and 11.5 percent of black women held jobs in industrial operations, fabrication, precision crafts, repair, or as laborers. Statistics for white men and women for the same categories were 37.7 and 8.6 percentage points, respectively (Loury 176). However, over the past 30 years, the United Sates and the developed world has been impacted by global economic restructuring facilitated by Information & Communications Technologies.

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 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 U.S. 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.

We stand in the midst of a twenty-first century computer-based information technology boom that is global and one that further levels the competitive landscape between rich and poor countries. However, it also has significant implications for the segment of poor African-Americans that failed to grasp a rung of the ICT-based economic ladder. Consider the case of outsourcing of technical and professional jobs to India.

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 rule 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, End of Poverty 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 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).

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.

Though massive amounts of poverty still exist on 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 (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" (Friedman, World 113). India was prepared to take advantage of ICT when it arrived. "I saw firsthand, repeatedly," says United Nations Special Advisor Jeffrey Sachs, "how India's ability to take advantage of the new IT possibilities resulted from its long-standing investments in higher education, especially in the Indian Institutes of Technology" (Sachs, End of Poverty 186).

Human Capital Readiness

Leveraging a new technology might require a group to fulfill new behavioral or intellectual requirements, commensurate with the new behavioral or intellectual possibilities opened up by the technology (McGinn, Science 97). Therefore, when considering the digital divide in America, it is instructive to do so in the context of overall educational preparation, social acceptance, and economic opportunity available across race and class lines. The parity, or lack thereof, between whites and African-Americans serves as a good example. A disproportionately large number of blacks in the U.S. started on an tilted playing field for human capital development. For example, the U.S. Census Bureau reports that the poverty rate for black children under 18 ranged from 41 percent in 1970 down to 30 percent in 1999, compared to their white counterparts whose poverty rates ranged from 10 percent, to a high of 15 percent, back down to 10 percent during the same period (Loury 186). In an economy that generally requires two incomes to achieve middle class status, the National Center for Health Statistics shows that between 1970 and 1999, of all births to black mothers, unmarried

mothers ranged from a low of 38 percent in 1970 to a high of 60 percent in 1999, compared to from 8 percent to 20 percent for white mothers during the same period (Loury 196). The Census Bureau reported that the number of black children living with both parents declined from 60 percent to 40 percent, whereas the corresponding statistics for their white counterparts declined from 90 percent to 78 percent (Loury 198). Between 1972 and 1997, statistics from the National Center for Education Statistics show that among high school graduates, the employment rates ranged from 50 percent to 55 percent for blacks and from 75 percent to 80 percent for whites (Loury 187). For high school dropouts, the rates were a dismal 45 percent for whites and 42 percent for blacks in 1972, but by 1997 the employment rates for high school dropouts were 43 percent for whites and only 15 percent for blacks (Loury 186).

This data shows that, for whatever societal or internal group reasons one might apply for black poverty from the 1970s through the 1990s, the reality was that 85 percent of the high school dropouts and 45 percent of the graduates were unemployed, 60 percent of black children were not living in a household with both parents, and 30 percent of children lived below the poverty line. This is not an economically stable and intellectually nurturing environment in which children might take the best advantage of new educational and technological opportunities placed before them.

Research by the City of Philadelphia, in preparation of its *Wireless Philadelphia Business Plan*, indicated an inverse correlation between school poverty levels and both home computer ownership and Internet access (22). Given that 71 percent of Philadelphia public school students are considered 'low income' and 79 percent are either black or Hispanic, a strong case can be made that blacks in Philadelphia do not have an adequate or equal opportunity to take advantage of ICT.[16] Similar data exists for other cities, including but not limited to: Chicago, Detroit, Milwaukee, Boston, and New York (Kozol 321-324).

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.

> Despite societal gains, the overall status of blacks is just 73 percent of their white counterparts, marginally unchanged from the 2004 report. More significantly, the widest disparity for blacks remain in economics, revealing an 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 [on a per capita basis]. 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 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 (National Urban League 4-5).

[16] Philadelphia school racial and income demographics sources: National Center for Education Statistics of the U.S. Department of Education, 2002-2003, and the Pennsylvania Department of Education, 2002-2003 (Kozol 322, 325).

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.

Would Ubiquitous Access to ICT Even the Odds?

As a result of public and private support for providing computers and Internet access in U.S. 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 Urban League's index in 2004 illustrated that twice as many white families had Internet access compared to their black counterparts. The 2005 index shows blacks' status at an 18-point improvement compared to whites with home Internet access. However, though the overall index shows improvement in closing the divide, there are troubling examples of resistance or lack of understanding of the importance of Information & Communications Technologies among the poorest of the community. Consider the example of the perceived irrelevance of ICT to the chronic poor in LaGrange, Georgia.

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[17] (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 television 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 TV set-top box, the television screen, 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 personal computer (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

[17] OC-12 stands for Optical Carrier. It conforms to the SONET communications standard and provides services at 622.08 Mbps (a transmission speed of 622,080 bits per second).

> 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).

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 hoped for 6,000 to 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[18] (McFarlan 16).

However, 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). Sadly, the goal of encouraging workforce education for those in the lowest socio-economic status was not met. City Manager 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).

Willie Edmondson, the City Councilman who represented the district that included the housing project, explained it simply as, "If they don't need it, they won't get it." Tonyka Bartley, as resident of the housing project, commented: "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."(McFarlan 10).

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 [LaGrange Internet Television initiative] 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.

LaGrange reinforced what many education practitioners already knew. In the mid-1980s, the grassroots work at the Cincinnati National Technical Association (NTA) also demonstrated that one should not be so presumptuous as to believe that technology will solve all of our educational problems.[19] The NTA found that technology cannot solve the problems of school funding, institutional

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[18] 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 using other services. 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 television. An additional explanation centers on the cost. The 'Free Internet Initiative' was not really free. To get the free system, one must already have been 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).

[19] 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

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.

The computer cannot be offered as the total solution, but as an important classroom tool that can empower teachers, administrators, and students. As Edwyn James of the Centre for Educational Research and Innovation (CERI) 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.

The Vicious Cycle of Racial Expectations

LaGrange may also teach another lesson – the power of self-reinforcing stereotypes, not only as oppression of the minority poor by the majority's socio-economic system, but also the power of stigma on the minds of the poor, especially the African-American poor. This is similar to the situation observed by Gunnar Myrdal in 1944, where 'vicious circles' of cumulative causation created self-sustaining processes in which the failure of blacks to make progress justified for whites the very prejudicial attitudes that served to ensure that blacks would not advance (Loury 6). Glenn Loury explains that there is no need for objective rules of racial taxonomy, "It is enough that influential observers (passersby on the street, new neighbors before the moving van arrives, policemen, employers, bankers, and so on) hold schemes of classification in their minds, and act on those schemes. They need not make their schemes explicit; their methods of classification may well be mutually inconsistent, one with another. And while it may be true that these agents could not give cogent reasons for adopting their schemes, it is also the case that they are unlikely ever to be asked to do so" (22). Loury goes on to explain the complex social interaction of self-confirming stereotypes as mattering because observers and the observed expect them to matter. "This expectation induces agents to interact with subjects in a manner that depends on race, thereby creating different incentives for subjects in racially distinct population subgroups" (28).

Loury explains that racial stigma finds itself, not just perpetuated by whites, but by blacks themselves on other blacks. "Responding to these incentives, subjects adapt according to how they expect to be perceived, which is to say, they adapt differently depending on their race. In the equilibrium, this race-varying behavior by subjects is consistent (on average) with observing agents' initial beliefs, confirming the agents' supposition that a subject's race would be informative" (28). Stigma sets limits within the minds of the black poor, a type of self-imposed mental slavery, as described by Carter G. Woodson:

> The problem of holding the Negro down, therefore, is easily solved. When you control a man's thinking you do not have to worry about his actions. You do not have to tell him to stand here or go yonder. He will find his 'proper place' and will stay in it. You do not need to send him to the back door. He will go without being told. In

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in 1981, blacks represented only 0.93 percent of the total while 14 percent of the U.S. 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 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 U.S. high school graduates completed three years of mathematics. Less than eight percent completed a calculus course and less than one-third of U.S. 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). We found that computers alone would not solve this problem.

> fact, if there is no back door, he will cut one for his special benefit. His education makes it necessary (xiii).

In the case of adoption of computer technology for Internet access, one might reapply Thomas Sowell's observation of the impact of racial stigma and self-reinforcing stereotypes on the poor blacks of LaGrange:

> If individuals from some racial or ethnic backgrounds find doors closed without regard to their individual capabilities and behavior, that reduces their incentives to acquire socially valued capabilities and behavior, imposing external costs on society at large from decisions of particular employers, landlords, and other transactors (32).

Stated simply, if poor blacks in the housing projects of LaGrange thought that there were no expectations and no benefits to learning how to master the Internet, either for economic, educational, political, or social gain, then it is not surprising that they failed to see the relevance of investing their meager resources in such mastery.

These are structural problems involving history, technology readiness, educational preparation, social expectations, and personal aspirations that have and continue to be influenced by race. If this is accepted, then one is led to conclude that 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. Since the actual divide is structural, computer-based solutions do not solve these fundamental social problems. While it is reasonable to accept that a gap in ICT ownership and Internet access exists between the chronically poor segment of the black community and the society at large, technology is required but insufficient to address racially stratified social problems. Humans must address the human problems.

Chapter Three

The New Public Infrastructure

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

In today's society, Information & Communications Technology is more than a consumer product that is subject to the economic rules of diffusion.[20] ICT has become the de-facto foundation of the socio-economic infrastructure. Kathleen Cooper, the Under Secretary for Economic Affairs of the Economics and Statistics Administration and Michael Gallagher, Assistant Secretary and Administrator of the National Telecommunications and Information Administration proclaimed in the foreword to their joint 2004 report, *A Nation Online: Entering the Broadband Age*:

> Now, more than ever before, high-speed connections promise to enhance our Nation's productivity and economic competitiveness, improve education, and expand health care for all Americans. High-speed networks provide the power to erase geographic, economic, and cultural gaps. With high-speed connections, American workers can find jobs; small businesses can have global markets; rural doctors can consult with specialists; and students can take classes that are taught from across the country.
>
> Because of the significant promise of this technology, President Bush has set out a bold vision for broadband in America, establishing a national goal for "universal, affordable access for broadband technology by the year 2007."

Balancing Commercial and Public Interests

Obviously, with the rapid globalization of manufacturing, the service sector, and now intellectual capital itself, and with the web of computers, online libraries, and information service providers, Information & Communications Technology has much more powerful implications to the overall economic opportunity of a society than a mere set of consumer electronics devices. ICT has become the modern infrastructure for opportunity!

In the U.S., the provision of public infrastructure, such as electricity, has been seen as a public good that should be available to all since Franklin Roosevelt's *Executive Order 7037* that established the Rural Electrification Administration in 1935, the preamble of which included the following language:

> By virtue of and pursuant to the authority vested in me under the Emergency Relief Appropriation Act of 1935, approved April 8, 1935 (Public Resolution No. 11, 74th Congress), I hereby establish an agency within the Government to be known as the "Rural Electrification Administration", the head thereof to be known as the Administrator. I hereby prescribe the following duties and functions of the said Rural Electrification Administration to be exercised and performed by the Administrator thereof to be hereafter appointed to initiate,

[20] Paraphrasing Everett Rogers, Stanford's Robert McGinn defines 'diffusion' as the process by which an innovation is communicated through certain channels over time among members of a social system, such as a city, profession, group, or national or international society as a whole (McGinn, Science 90).

> formulate, administer, and supervise a program of approved projects with respect to the generation, transmission, and distribution of electric energy in rural areas.

The current administrator of that order, the Rural Utilities Service of the Department of Agriculture, requires that all electric and telecommunications service providers adhere to Title VI of the *Civil Rights Act of 1964*, Section 504 of the *Rehabilitation Act of 1973*, and the *Age Discrimination Act of 1975* (Anderson, C. 1). In addition, Title II Section 201 of the *Civil Rights Act of 1964* requires that all persons be entitled to equal enjoyment of the public goods, services, facilities, and accommodations without discrimination on the basis of race, color, religion, or national origin (Wright 589).

Going beyond non-discrimination, the U.S. government sees inherent benefit to making communications infrastructure available to all and it is willing to subsidize or mandate special programs for the poor. Focusing on the universal service provisions of the 1996 Telecommunications Act, the FCC issued rules based on four goals. First, all universal service objectives established by the Act must be implemented, including those for low-income individuals, consumers in rural, insular and high cost areas, as well as for schools, libraries, and rural health care providers. Second, rates for basic service must be maintained at affordable levels. Third, affordable basic phone service must continue to be available to all users with the help of a universal service fund which will subsidize phone service for those who qualify. Fourth, the benefits of competition in the telecommunications arena must be brought to as many consumers as possible. Universal services supported by the fund includes:

- Access to a telephone network with the ability to place and receive calls,
- Access to touch tone capability,
- Single-party service,
- Access to emergency systems including, where available, 911 and Enhanced 911,
- Access to operator services,
- Access to 'interexchange' services,
- Access to directory assistance, and
- Limited long distance calling for those low-income users who qualify.

The *Universal Service* requirements of the *Telecommunications Act of 1996* also mandated a 'Lifeline Assistance Program' to subsidize the cost of monthly telephone bills for the poor. The 'Lifeline Assistance Program' was designed to mitigate the cost of monthly phone bills of qualifying low-income consumers and must be made available by all eligible telecommunications carriers in all states. When the regulation went into effect on January 1, 1998, Lifeline participants received $5.25 in federal support. In addition, Lifeline matched state funds up to $7.00 a month. In addition to 'universal services,' Lifeline customers were allowed to set a monthly limit on the amount of money spent on long distance calling, and if the long distance bills are not paid, then only the long distance service, and not the local service, would be cut off until the long distance bill is paid (National Telecommunications and Information Administration, *The New Universal Service*).

The *Universal Declaration of Human Rights*, adopted by the United Nations in 1948, also acknowledged the fundamental importance of and rights to communications and information access. It asserts that 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).

The cumulative effect of these laws and policies is to legitimize global Information & Communications Technology, when used for the public provision and delivery of services, as a new type of public infrastructure to which all citizens have a right to access and use. In fact, under the 1996 Telecommunications Act, schools and libraries could not only procure any telecommunications service on a subsidized basis, Internet access services were specifically designated as a target of the Act. Schools and libraries could apply federally-subsidized discounts to internal networking hardware technologies that were necessary to connect school or library terminals and computers to the

Internet.[21] Unfortunately, the human capital formation investments in training were not eligible for these discounts.

Not surprisingly, when local governments try to adopt allocation schemes for what has become public infrastructure, they are often challenged by private economic interests. Consider the examples of wireless Internet access planned by the cities of Philadelphia and San Francisco.

San Francisco announced in August 2005 that it would develop a program that would extend free or inexpensive wireless broadband communications service to the entire 49 square miles of the city. Mayor Gavin Newsom paid special attention in his announcement to the provision of access to the city's low-income neighborhoods. The San Francisco project is a project supported by technology companies Intel, Cisco, Dell, IBM, and Germany's SAP, and the program has been adopted by thirteen cities around the world[22] (Singer). In October 2005, the Internet search company Google also announced that it had submitted a plan to provide high-speed wireless services to San Francisco (Mills). The telecommunications companies -- SBC Communications, Verizon Communications, and Comcast Cable -- publicly and privately criticized the project as "foolhardy," given that low-cost access to the Internet is already widely available to the public in San Francisco (Olsen). Newsom's desire to tear down the digital divide between poor and wealthy people's access to broadband will likely result in a bill to block the project or preempt the effort on a federal level, observes the technology industry news service, C|Net (Olsen).

When Philadelphia's mayor John Street pushed to offer wireless broadband access to everyone, regardless of income and at below-market prices, there were similar claims of foul by the telecommunications industry. Philadelphia's deal is with Earthlink, an Internet service provider. Mayor Street sees ubiquitous wireless access as a twenty-first century utility that would give the 1.5 million residents an additional technological advantage, attract business and tourists (Smith). In addition, Street wants to address the 25 percent of the population, mostly in impoverished areas who cannot get online (Smith). Opponents, including other Internet service providers and, incredibly, labor and education groups, sponsored a bill through the Pennsylvania legislature that restricts other cities in the state from offering subsidized services when private alternatives are available (Smith). In addition, Madison River Telecom blocked the ability for its Philadelphia subscribers to use Voice-Over-IP or VOIP, which allows subscribers to make telephone calls over their Internet connections, according to Lawrence Lessig of the Stanford Law School.[23] Mayor Street, like his counterpart Mayor Newsom in San Francisco, believes that if the city controls other utilities, such as water and gas, they are within their rights to make sure that public services are available to all citizens, not just the middle and upper classes.[24]

Prerequisites to Effective use of Technology

While the Civil Rights Act was meant to address public transportation, lunch counters, hotels, and theatres, the public market for and provision of goods and services is increasingly based on computerized access to information available over the network infrastructure of the Internet. Effective use of ICT is fundamentally different in its skill set requirements than sitting at lunch counters, riding

[21] Universal service discounts available to schools and libraries covered electronic hardware components, such as networking hubs, routers, network file servers and server software, and maintenance of network systems (National Telecommunications and Information Administration, *The New Universal Service*).

[22] The 'Digital Communities' project includes: Cleveland, Ohio; Corpus Christi, Texas; Philadelphia, Pennsylvania; Portland, Oregon; Duesseldorf, Germany; Jerusalem, Israel; Taipei, Taiwan; Rio de Janeiro, Brazil; Gyor, Hungary; the Principality of Monaco; Seoul, South Korea; Osaka, Japan; and Westminster (London), England (Singer).

[23] Lessig cited this example at the *Open Source Business Conference* in San Francisco in April 2005.

[24] If telecommunications companies are not to be treated as utilities in cities like Philadelphia and San Francisco, perhaps another principle could work toward making ICT available on a fairer cost basis. It would 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. Farmer argued for this uniform ethic for the pharmaceutical industry, and it seems like an appropriate extension to ICT companies that provide public infrastructure (Farmer xxvii). 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.

buses, renting hotel rooms, or patronizing restaurants and theatres. The latter group requires no specialized training.

As Rawls might see it, giving the poor the right to use ICT infrastructure, yet neglecting to establish the conditions for effective use of that infrastructure is tantamount to denying access to it. Therefore, a prerequisite to compensatory justice demands that the chronically poor segment of African-Americans have a moral right to *human capital development* appropriate for the new challenges and opportunities that Information & Communications Technologies present.

Ray Marshall, former U.S. 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).

Basic training in digital technology can start early. Computers found their way into private and public schools in the U.S. over the past two decades and they have been used to enhance and strengthen the curriculum in basics, such as language, science and math. They have also become important tools in allowing teachers and schools to accommodate individual learning styles, enhance students' interactions with each other, build self-confidence, and improve motivation.[26] 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).

Not withstanding basic universal ICT training in schools and at the workplace, the change from an industrial to information economy is as sure and as troubling as the change from an agricultural to an industrial base. The new global information-intensive economy needs workers that

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[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.

[26] 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 1-6).

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 and was 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.

can quickly adapt to changes in the marketplace and make critical decisions at lower and lower levels of the workforce 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.

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.
>
> 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).

Given the structural changes going on in the global economy, changes which benefit highly-educated, flexible, entrepreneurial workers, 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 distribution of opportunity for economic and social development in a technological society and the conditions that have to be satisfied for that distribution to be just.

Chapter Four

Repairing the Structural Divide

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

The widening gap between rich and poor is due, in part, to a major technology-enabled shift in the nature of education, work, and governance on a scale equal to other great technology-enabled social shifts, such as the agricultural and industrial revolutions.

Western society has had to deal with these sorts of structural economic and social changes before. Referring to the Industrial Revolution in Britain, the 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).

Industrial Dislocation, the British Example

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.

While technological progress offered opportunities for the poor, it also widened the gap between those capable of exploiting technologies and those relegated to unintentional victimization. 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. By the early 1900s, it also began to recognize the needs and rights, not just of the landed gentry and the commercial class, but also the industrial workers.[27]

Britain dealt with the distribution of social benefits and burdens relevant to the long-term well-being of society. In addition, distributive justice helped guide British society to override some individual property and autonomy rights, if doing so maximized the public's interests. For example, 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

[27] 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 its socialism, rather than Marxism (Childs 9).

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'[28] (Budge 8-9).

The Black American Industrial Experience

So, what was the parallel for African-Americans during the era of industrialization? Blacks could be free U.S. citizens and have an education, but equality of employment and economic opportunity came slowly and at great cost. On June 25, 1941, a reluctant Franklin Roosevelt, facing a march on Washington by black laborers led by A. Philip Randolph, signed *Executive Order 8802* banning discrimination based on race in the part of the defense industry that had federal contracts. It also established the Fair Employment Practices Committee to ensure against discrimination based on race, creed, color, or national origin (Wright 510-511). While defense contractors and labor unions working in the defense industry were barred from discriminating, it took Harry Truman's *Executive Order 9981* on July 26, 1948 to desegregate the armed forces (Wright 522-523).

The long march of legislation, executive orders, and court decisions culminated in a comprehensive bill which sought to outlaw discrimination based on race in voting, education, public accommodations, employment, and any federally funded program. This was President Lyndon Johnson's *Civil Rights Act of 1964*. Title VII Section 703 required equal employment opportunity. This made it unlawful for an employer, labor union, joint labor-management committee controlling apprenticeship or other training program to "fail or refuse to hire"… "limit, segregate, or classify his employees"…"deprive or tend to deprive any individual of employment opportunities"…or "limit such employment opportunities or otherwise adversely affect his status as an employee or as an applicant for employment" based on race, color, religion, sex, or national origin. In addition, it prohibited unions from exclusionary membership practices and it forbade employment agencies to "fail or refuse to refer for employment, or otherwise discriminate against, any individual because of his race, color, religion, sex, or national origin" or to "classify or refer for employment" on these bases (Wright 590)

Anti-discrimination laws assisted blacks in getting onto the first rungs of the industrial sector's economic and career ladders. However, 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 develop industrial-era skilled trades or even service sector skills by making ICT more available to the poor, they may not have adequately taken into account the structural changes in the nature of the global economy.

From Industrial to Information-based Economy

Daniel Griswold highlights the direct link between technology and the number of people displaced, "Technological change and other nontrade factors account for most of the workers

[28] 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).

By the 1980s the New Right's 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). 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 ensure 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). 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.'

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). As such, 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 U.S. – from welfare to work.

displaced from their jobs each year" (Griswold 1). At the same time, it is technology that opens the door to new economic opportunity. For example, 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, natural materials that were turned into manufactured products were strategic resources. 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 U.S. 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.

Brink 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.

As this shift to an information-based economy accelerated at the end of the twentieth century, let us examine how African-Americans were prepared to exploit its opportunities. The Bureau of Labor Statistics showed that in the 1999 service sector, 17.4 percent of black men and 25.6 percent of black women held positions, while their white counterparts were 8.9 percent and 16.2 percent, respectively. However, in the high growth occupations of technical, sales, administration, professional specialties, and managerial positions, 49.2 percent of white men and 74 percent of white women held positions. For their black counterparts, 62.7 percent of black women and 36.4 percent of black men held similar positions (Loury 176). While the skills gap among blacks and whites among technical, professional, and managerial jobs in 1999 was 11.3 percent for women and 12.8 percent for men, even for those with college degrees, black men earned $15,000 less and black women earned $3,800 less than their white counterparts, according to Census Bureau statistics (Loury 177).

Global Outsourcing of Intellectual Capital

The globalization of service sector jobs and intellectual expertise will likely further exasperate the competitive situation for those just starting to make progress in the corporate structure. Again, examining the work outsourced to India is an instructive example.

A generation of Indian engineers and entrepreneurs took leadership positions in Microsoft, McKinsey & Company, Citigroup, investment banks, information technology firms, and other major international companies (Sachs, End of Poverty 179-180). Those overseas Indian executives established business relationships back in India. When the U.S. 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.

In 2004, 100,000 U.S. tax returns were prepared in India and 2005's estimate exceeds 400,000 returns (Friedman, World 13). There are over 245,000 Indians staffing call centers providing customer support and telemarketing (Friedman, World 24). 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 U.S., 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).

Columbia University economist Jeffrey Sachs, a special advisor to the United Nations' Secretary General, Kofi Annan, notes, "India's export boom has continued to deepen, extending from

traditional 'back-office' operations (basic software, data transcription, telephone call centers) to increasingly sophisticated business process outsourcing [BPO]. U.S. 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).

According to a report from the Institute for the Future (IFTF) in Menlo Park, California, "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, 2003 Ten Year Forecast 144).

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 domain 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 U.S. Patent Office from these companies' Indian R&D units. The Texas Instruments team in India has been awarded 225 U.S. patents (Friedman, World 30).

IFTF's long-term assessment of the globalization of intellectual capital is this:

> For decades, the educational and entrepreneurial opportunities afforded by the United States have led to a brain drain in many developing nations, especially in Asia. Now, however, with increased economic opportunities at home, many Asians are returning home after gaining their education abroad. Furthermore, as wealth among the developing Asian nations grows, their domestic education infrastructure will also improve. If tens of millions of Chinese and Indian scientists and engineers flood the world labor pool over the next decades, many of the innovative jobs in the current industrialized world are likely to go to them. Thus, although the transition of economic power will take time, Asia is probably only a couple generations away from becoming the economic hub of the world (IFTF, 2004 Ten Year Forecast 37).

Separate and Unequal

Well before the obvious educational requirements for the modern information economy, the derived moral right to equal educational opportunity was established from the moral and legal right to equal protection guaranteed by the Fourteenth Amendment. The *Brown v. Board of Education* case, decided by the Supreme Court in 1954, recognized the importance of the legal right to equal education, as noted in the words of Chief Justice Earl Warren:

> Compulsory school attendance laws and the great expenditures for education both demonstrate our recognition of the importance of education to our democratic society. It is required in the performance of our most basic public responsibilities, even service in the armed forces. It is the very foundation of good citizenship. In these days, it is doubtful that any child may reasonably be expected to succeed in life if he is denied the opportunity of an education. Such an opportunity, where the state has undertaken to provide it, is a right which must be made available to all on equal terms (Wright 531).

The *Brown* decision went on to establish the fundamental inequality of separate but equal black and white schools. "We conclude that in the field of public education the doctrine of 'separate but equal' has no place. Separate educational facilities are inherently unequal" (Wright 531).

Though the U.S. public school system was legally desegregated over the past 50 years, de-facto segregation persists along economic lines, that themselves are determined by historical racial inequities. Jonathan Kozol, who worked in inner-city school systems for over 40 years, believes that an apartheid public school system has re-emerged. "Virtually all the children of black or Hispanic

people in the cities that I visited, both large and small, were now attending schools in which their isolation was as absolute as it had been for children in the school in which I'd started out so many years before, " he explained. By the academic year 2000-2001, 95 percent of the public school enrollment in Detroit, 94 percent in Washington, D.C., 88 percent in Baltimore, 87 percent in Chicago, 84 percent in Los Angeles, 82 percent in St. Louis, and 78 percent in Cleveland and Philadelphia were black or Hispanic (Kozol 8). Kozol cites a teacher at P.S. 65 in the South Bronx that taught only one white student in 18 years. "Two tenths of one percentage point now marked the difference between legally enforced apartheid in the South of 1954 and socially and economically enforced apartheid in this New York City neighborhood" (Kozol 9).

Though there are social benefits to desegregation, such as a broadened perspective of diverse cultures and histories and the weakening of stereotypes, the most important issue, as it relates to this project is the correlation of racial enclaves with poverty and academic performance. Kozol notes that, "A segregated inner-city school is almost six times as likely to be a school of concentrated poverty as is a school that has an overwhelmingly white population"[29] (20).

Although standardized tests do not provide an accurate prediction of a particular student's likely academic progress, it is instructive to note that from 1976 through 1996 the National Center for Education Statistics reported mean SAT scores ranging from 950 to 1,000 for white students and from 700 to 790 for black students (Loury 202). Math scores for white 17 year olds ranged from 310 in 1973 to 315 in 1999, mapping to a category defined as requiring "moderately complex procedures and reasoning." The same statistics show black 17 year olds having math scores ranging from 270 to 283, categorized as requiring only "numerical operations and beginning problem solving." Reading scores for the same period ranged from 291 to 295 for 17 year old white students and from 239 to 264 for their black student counterparts. These reading scores indicated a difference between black students being able to "interrelate ideas and make generalizations" and the white students' abilities to begin to "understand complicated information" (Loury 180-181).

If literacy and abstract mathematical thinking are prerequisites to advantageous use of the computerized information tools increasingly required for economic and democratic participation, the U.S. still has a significant inclusion problem, when it comes to poor citizens of color. The structural differences that perpetuate class and economic disadvantage along racial lines, when applied to the public school system's delivery of services, including those services increasingly delivered via computers, is a modern violation of *Brown v. Board's* admonition that *separate* is inherently *unequal*.

What is an Appropriate Education in the Digital Era?

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 providing Rawlsian-style benefits to those most negatively affected by technological change, how should opportunity be provided? In education, is 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?

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 within the African-American community. Booker T. Washington (1856-1915), 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.[30] He urged strong vocational education in agriculture and the skilled trades at the

[29] Only fifteen percent of the intensely segregated white schools have a population in which more than half of the students are poor enough to receive free or reduced priced meals. The corresponding statistic for black and Latino schools is 86 percent (Kozol 20).

[30] 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

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 (1868-1963), the Harvard-educated black sociologist and professor who later served as an editorial voice for the National Association for the Advancement of Colored People (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 stated in 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).

Mr. Washington's critics say that he ignored the main reason for blacks' existence in this country -- servitude. As historian 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.[31]

However, there were also critics of the educational system made available to African-Americans. As far back as 1933, Carter G. Woodson (1875-1950) criticized the misaligned goals of

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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 (Washington 131-158).

[31] 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).

highly-educated blacks in his treatise, The Mis-Education of the Negro. Woodson considered the educational system as it developed in both Europe and America as an "…antiquated process which does not hit the mark even in the case of the needs of the white man himself." But in the case of blacks, Woodson saw the educational system as being one of mind control. "The Negro's mind has been brought under the control of his oppressor. The same educational process which inspires and stimulates the oppressor with the thought that he is everything and has accomplished everything worthwhile, depresses and crushes at the same time the spark of genius in the Negro by making him feel that his race does not amount to much and never will measure up to the standards of other peoples. The Negro thus educated is a hopeless liability to the race" (xiii).

This was the kind of harsh reality that Booker T. Washington ignored.[32] This was 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 might jeopardize their own status in American society, as Shostak and Gomberg found in their 1965 study, the situation remains unpromising.

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 Benjamin 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 technological progress and unfortunately his graduates had to struggle blindly through yet another foreign economic system.

Today, the foreign economic system that a large segment of the African-American poor needs to master is one based on the value of ideas and the ability to exploit a global marketplace. 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. Access to the tool is useful only to those prepared to use it. Washington could prepare ex-slaves for skilled trades, but those specific skills are of no value when relevant goals cannot be accomplished. In today's information economy, computers and Internet access are required, but are insufficient for socio-economic advancement.

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 creative thinkers, yet our technology-based society demands marketable, quantifiable, technical skills for success. 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 many things and specialists in a few.

However, 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. Additional discussion of the outdated educational approach is presented in Note II.[ii] Business

[32] Washington's education for passivity is in direct contrast with the reality of the challenge. Kwame Toure (1941-1998), previously known as 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).

leaders are correct. We are not training students for today's high-technology business world. The scholars 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 have difficulty thinking independently or creatively. So, a new generation of the DuBois-Washington debate rages.

What is an appropriate education today? The prescription seems to be the same as it was in the 1980s, when personal computers were newly introduced into schools. 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. However, 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 (Henriques).

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. Note III provides additional detail on what seems to be a more appropriate educational approach.[iii] Michelle Small's prescription of over twenty years ago is still valid. She recommended that, regardless of their subject of study, students 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 (Small 345-349).

The chronic poor should 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. This might allow one to view the world according to the holistic or systems theories being advocated by futurists such as Marilyn Ferguson, who suggested that one should, "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.

Since lifelong learning and skills retraining are required, policies that seek to close the digital divide should 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 the early 1990s by saying, "By the end of this 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 6). Much of this technology was already there in the 1990s and was, or was soon to be, adopted for this purpose. This included 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 to 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 5). In barely ten years, the personal computer evolved from a classroom novelty to a widely used instructional tool.[33] Today, Apple's predictions of a student using a computer to explore a virtual

[33] 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

museum, moving room to room, examining exhibits via long-distance interactive three-dimensional movies has come true. New technologies, such as digital video and distance learning using 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 could not 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 (White 6). 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.

Given that training on the use of computer technologies can focus on tools for research and exposition of ideas as well as practical tools for either employment in the ICT industry, for such hands-on jobs as repair and customer support, or for entrepreneurial business ventures, the discussion of skilled trades versus higher-order academics is brought back to the surface.[34] One might look at debates between those who propose vocational and technical education versus those who demand enlightened liberally educated leadership to 'look out for the best interests' of the masses to be a revisiting of the DuBois-Washington debate.[35]

Reforming the U.S. 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, in order to provide an infrastructure for the industrial order. 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 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.

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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 4).

[34] 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 Rockefeller 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.

[35] 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).

Chapter Five

Unintended Consequences of Misapplied Technology

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

-- Abraham Maslow

Information & Communications Technologies, by themselves, do not create social problems for African-Americans, but their distribution and use exacerbate the social and economic inequities that already exist in society[36] (Sachs 31). The inequities of opportunity created by the skewed distribution of ICT resources toward the rich, powerful, and white are not just a function of the price and availability of technology nor of differential access to that technology. Those inequities existed as social problems before modern ICT's development. Technology exacerbates the differences between 'haves' and 'have nots' with regard to economic opportunity, educational attainment, participatory democracy, and the ability for the group to communicate and represent itself.

Given that these inequities exist and are being further aggravated by ICT, it is incumbent upon society's leaders, especially those elected to represent a supposed enlightened Western democracy, to make public services and infrastructure available to all segments of society, without regard to socio-economic status, race, gender, and religion. Correct? Title II Section 201 of the *Civil Rights Act of 1964* requires that "All persons shall be entitled to the full and equal enjoyment of the goods, services, facilities, and privileges, advantages, and accommodations of any place of public accommodation as defined in this section, without discrimination or segregation on the ground of race, color, religion, or national origin" (Wright 589). However, the 'without regard to' ignores the inescapable facts of historical and contemporary overt and covert institutional 'isms' of which the government, as a biased political entity, has been and continues to be complicit.

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 government-promoted technological change? A raging debate centers on what can be done to alleviate the digital divide, provide a fairer distribution of ICT benefits, and minimize the alienation and dislocation that accompany new technology implementation. That debate is further complicated by perceptions of the need for proactive steps to redress the infringement of rights in what has come to be believed, but not practiced, as a 'color-blind' classless society.

The Fallacy of Race Indifference

Conservatives believe that market forces should rule and that no affirmative actions are needed to provide the basis of equality. For example, the African-American Supreme Court Justice Clarence Thomas argued in the 1995 *Adarand v. Pena* federal highway construction 'set aside' case

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[36] Jeffrey 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 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 31).

that, "Government-sponsored racial discrimination based on benign prejudice is just as noxious as discrimination inspired by malicious prejudice. In each instance, it is racial discrimination, plain and simple" (Wright 774-775). However, referring to the same case, the white Justices John Paul Stevens and Ruth Bader Ginsburg noted that, "There is no moral or constitutional equivalence between a policy that is designed to perpetuate a caste system and one that seeks to eradicate racial subordination. Invidious discrimination is an engine of oppression, subjugating a disfavored group to enhance and maintain the power of the majority. Remedial race-based preferences reflect the opposite impulse: a desire to foster equality in society" (Wright 774).

It is ironic that civil rights laws, which bar discrimination based on race, gender, color, religion, national origin, and recently, sexual preference, fail to address their intended targets because class, caste, and socio-economic position in America are not specifically called out as factors for which discrimination may not be practiced. In an historical context, racial discrimination, for example, has had the effect of creating a racially-skewed economic subclass. Justice Thomas, in his zeal to expound color-blindness, becomes blind to the obvious inequities that are rooted in American society. The U.S. has not progressed that far from the state espoused by the 1968 Kerner Commission Report that, "Our nation is moving toward two societies, one black, one white – separate and unequal" (Wright 651). Admittedly, America of 2006 is far more plural than the black and white designations of the 1960s' South, but we continue to move toward two societies, one rich and the other poor – separate and unequal – where a large percentage of the poor are African-Americans.

Color-blindness, though admirable in some respects, ignores the reality and allows the culpable to escape responsibility for being part of the solution. As the Kerner Report noted, " What white Americans have never fully understood – but what the Negro can never forget – is that white society is deeply implicated in the ghetto. White institutions created it, white institutions maintain it, and white society condones it" (Wright 651). It is therefore wise to act in a manner harkening back to President Harry Truman's words, "We cannot properly understand the American civil rights record without giving attention to the composition of the American people" (Wright 522).

With regard to voting rights, Title I Section 101 of the *Civil Rights Act of 1964* required that, no person "… in determining whether an individual is qualified under State law or laws to vote in any Federal election, apply any standard, practice, or procedure different from the standards, practices, or procedures applied under such law or laws to other individuals within the same county, parish, or similar political subdivision…deny the right of any individual to vote in any Federal election… or employ any literacy test as a qualification for voting in any Federal election unless (i) such test is administered to each individual and is conducted wholly in writing, and (ii) a certified copy of the test and of the answers given by the individual is furnished to him within twenty-five days of the submission of his request" (Wright 588-589).

Society ignores at its own peril the inequities in democratic participation further exacerbated by well-intentioned computerized voting practices. 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 system be implemented without excluding those who have no access to it? A system that 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[1] (Wilhelm 67-71).

The Arizona Democratic primary may have had the effect of skewing the vote toward those who are white, educated, middle and upper class, by virtue of their ability to vote electronically over four days, where those relying on physical ballots were allowed one day. Arizona may have violated the spirit, if not the letter, of the *Voting Rights Act of 1965*. Inadvertently, or perhaps indifferently, Arizona Democrats allowed a practice that enfranchised one group more and, by virtue of computer voting for the technically literate, applied a literacy test that disadvantaged some citizens.

There is also the case of the Florida election of 2000. Florida election officials gave laptop computers to precinct workers so they could have direct access to the State's voter rolls, but the computers only went to some precincts and only one went to a precinct whose citizens were

predominantly black, as Congresswoman Maxine Waters entered into the Congressional Record. The technology gap in the no-laptop precincts forced the workers to rely on a few overwhelmed phone lines to the head office. Voters whose names did not appear on the rolls were held up, while workers tried to get through on the phone for hours or until they gave up. Also, 185,000 Floridians cast ballots that did not count. Ballots that were thrown out were disproportionately those with computer punch cards, found in most black precincts, rather than those that used optical scanning machines. Waters cited, for the Congressional Record, that, "In Miami Dade, the county with the most votes cast, predominantly black precincts saw their votes thrown out at four times the rate of white precincts." Citing the New York Times, Waters notes that, "One out of eleven ballots in predominantly black precincts were rejected, a total of 9,904" (Wright 783).

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.

Arizona and Florida's use of computers in the electoral process was no doubt meant to enhance efficiency and expand the franchise to a broader population. However, when the effect of the right granted creates a negative impact on a recipient, does the recipient have a *positive right* to protection from the right granted? 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."

When it comes to government delivery of services through computerized means, known as 'eGovernment,' plans often emphasize the use of the Internet, personal computers, and public kiosks as tools. However, some regions 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). This is tantamount to replacing 'White Only' signs from the 1950s and 60s with 'Digital Only' signs today.

Consider as well, how the U.S. 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.

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 technology community, as well as the individual engineer, must be vigilant in their efforts to recognize subjective bias and make adjustments for it.

Rawls' Difference Principle as a Guide for Technologists

These examples show how, with ICT as the technological vehicle, civil rights, such as equal access to governmental services and the right to a fair voting process are being violated for some in order to make life easier, less expensive, and more productive for others. This is contrary to John Rawls' *Difference Principle*, which requires that any unequal distribution of technological resources, here ICT resources, be beneficial to all and allocate the greatest benefit to those currently the worst off.

Ian Barbour sees the danger, not in technology as such, 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. 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 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 2006 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.

Philosophical theories of justice attempt to resolve questions of fair distribution of benefits and costs of technology by providing explanations as to why distinctions are made in any unequal distribution of benefits and burdens (Munson 37-38). 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 where each person has a right to basic communications and educational infrastructure?

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 needy underserved populations. Traditional philosophical approaches suggest allocation of scarce resources according to the following scheme (Beauchamp 228):

1. To each person an equal share (egalitarian)
2. To each person according to need (beneficence[37])
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 Tom Beauchamp and James Childress. However, in the United States, it seems that an over reliance on free-market exchanges has led to a de-facto allocation scheme internally and a denial of resources and services to those who cannot afford to pay 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 access to the public infrastructure for communications, information, and education. Inequalities in the technology diffusion system can be justified only if those in most need can benefit the most 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).

This project contends that the distribution of access to public infrastructure and services might meet a better test of fairness if it were based on the following hierarchy of principles and assumptions, in this explicit order:

1. Egalitarian (equal share). If resources are still constrained, then…
2. Social utilitarian (according to merit). If resources are still constrained, then…
3. Scientific utility (according to contribution). If resources are still constrained, then…
4. Individual beneficence (according to need). If resources are still constrained, then…
5. Cost effectiveness (according to effort). If resources are still constrained, then and only then…
6. Libertarian (according to free-market exchange), especially as it relates to technology in support of individual desires that may be at odds with the public interest, then

[37] *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).

7. Lottery, as a tie-breaker

To the extent that the government, as society's proxy, and blacks themselves are responsible for social inequity, the people's representative government is morally responsible for programs to close the digital divide by reinterpreting seminal civil rights laws and milestone cases to address digitally-exaggerated inequities. As *derivative moral rights,*[38] further codified as legal rights by the U.S. Government, to fair access to jobs and services, the *Civil Rights Act* needs to be revisited. *Brown v. Board of Education* helps shape educational access arguments. *The Voting Rights Act* can be updated to prevent digital disenfranchisement (Wilhelm 61). Each of these civil rights needs to be examined in the context of the Difference Principle to determine the extent of any unintentional or uncaring negative impact on disadvantaged communities.

[38] Derivative moral rights are concrete, context-specific moral rights, for which the prevention of attainment of the right is inconsistent with the affirmation of the universality of its associated moral right. For example, the Occupational Safety and Health Act of 1970 may be thought of as codifying a derivative moral right to a safe and healthy workplace since this is critical to a worker being able to secure a livelihood and thereby sustain the life to which she or he has a undisputed moral right (McGinn, *Engineer's Moral Right* 222-223).

Chapter Six

Moral Obligations of Recipients

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

In order to stop the cycle of "starting behind," blacks themselves are also morally obligated to contribute to their attainment of human rights and prepare for the inevitable advent of the next generation of technology-induced opportunities and threats by taking advantage of society's recompense. In addition to their starting position in relation to a new technology's introduction, the self-reinforcing social and institutional expectations associated with racial *stigma* (Loury 6, 168), as well as in-group assumptions about the relative value of new technologies to the lives of the systemic poor, current and former members of disadvantaged groups also play important roles in the successful adoption and exploitation of new technologies. However, as Robert McGinn stresses, "Moral rights are not absolute in an undifferentiated sense. A moral right can be binding without exception only within a finite, bounded domain. Depending on the circumstances, it may be morally permissible to override it in the name of other weighty considerations of greater magnitude" (McGinn, *Engineer's Moral Right* 224).

Although African-Americans may be owed redress, they do not have an unbounded positive right to ICT infrastructure if provision of those resources prevents their fellow citizens from further 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. Nor do they have a right to demand resources, if they do not take advantage of those resources. 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, Technology 14-15).

In cases where the aggregate unbounded rights of a pre-technical era are extended to individuals and their actions harm society or take resources away from important social priorities, 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.

According to McGinn's criteria, provision of unused ICT and educational assistance programs:

- Detracts resources and the best expertise away from non-profitable, non-glamorous, and non-cutting edge careers that are no less needed by the society,
- Engenders a financial cost that is subsidized by the public through direct payments, infrastructure funding, and tax breaks,
- Devalues the worth of human capital development, and most importantly,
- Allows the very real threat of massive inequality to fester, which could affect long-term security.

Therefore, if society offers reparations, it would be immoral the black community to squander those resources. In this context, the LaGrange, Georgia 'Free Internet Initiative' is an example of squandered opportunity (McFarlan 10, 24) and (Keil 8-9).

Moral Obligations of the 'Digirati'

This project has addressed the need for both social action, through government intervention as the public's proxy, and the moral obligations of the African-American poor to avail themselves of programmatic opportunities offered by society. But, what about individual technologists, especially engineers from the African-American community? As new entrants join the 'Digirati,' what ethical obligations do they take on as technical professionals, and especially as members of the underserved communities?[39]

Is a significant re-evaluation of the ethics of distribution and of the professional responsibility of computer scientists and software engineers called for? Consider how Oracle executives in an interview indicated a profound lack of ownership of 'policy issues,' such as the balance between privacy and security. 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). To the extent that Oracle is typical of technology companies, ethical issues may need to go beyond prevention of government and business abuses; one must demand a higher standard of those who are knowledgeable and powerful but cavalierly irresponsible technologists.

There are other consumer-oriented implications of ICT to consider. 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 on 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 personal files by agencies to judge our creditworthiness, our insurability, our employability, educatability, and our desirability as neighbors or tenants. There is 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 differential 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 automated teller machines (ATMs), and lower or no fees for using online banking. Without equipment, 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.

The Digirati's moral obligations as professional engineers requires them to ask how ethics can play a role in assuring that the raw commercial interests of ICT do not overshadow the overall public good. They are morally obliged to seek a more relevant or 'qualified 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 found in contemporary practice. As this project has presented, in the technologically intensive society of twenty-first century America, indeed in the global capitalist market as a whole, 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. If unfettered, technology also puts at risk the welfare of global society through the privatizing maximalist tendencies of a relatively few

[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.

wealthy elite at the expense of the bulk of the world's destitute citizens. Note IV provides additional discussion of the moral responsibilities of engineers.[iv]

In the case of ICT developers, they need to also conform to the ethics espoused by the Association for Computing Machinery (ACM),[v] the Institute of Electronic & Electrical Engineers (IEEE), [vi] and the ACM/IEEE-Computer Science Joint Task Force (ACM/IEEE-CS)[vii] which reaffirm not only the obligation of software engineers to 'do no harm,' but the importance of working in a positive, proactive, life-affirming fashion to improve society as a whole. Excerpts from the ACM's ethics canons include:[40]

- 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 in the manner of Rawls, the engineering profession would be better equipped to address ethical dilemmas with confidence.

Ethnic Dualism of the 'Talented Tenth'

Tools alone are not sufficient. Personal commitment to the social and economic betterment of disadvantaged communities should also come from within communities of technical practitioners. In this regard, Dr. DuBois 'Talented Tenth' and recent lessons from Indian and Chinese entrepreneurs demand a final comment.[41]

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

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[40] See Notes V, VI, and VII for complete versions of the ACM, IEE, and the Joint ACM/IEEE-CS ethics canons.

[41] W.E.B. DuBois promoted the concept of a highly educated cadre of leaders that he called the 'Talented Tenth.' He hoped they would lead the disadvantaged blacks of the early twentieth century from the agrarian to the industrial economy, with enlightened public service as their guiding principle.

> 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, 2003 Ten Year Forecast 144).

This is exactly what W.E.B DuBois proposed for a cadre of educated Negroes at the turn of the twentieth century. 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 parallel destiny, is still possible and is the strategy many successful expatriate Asian entrepreneurs have used. 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 they could be lost through political ineptness and unjust laws.

Unlike their Indian and Chinese counterparts, too often the move of African-American 'Digirati' to the suburbs breaks linkages with inner city black communities. 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, as Indian and Chinese entrepreneurs have done in their home lands, the black middle and upper classes seem to strive toward full assimilation into the corporate American mainstream. They have not heeded the lessons of ethnic entrepreneurial dualism so successfully embodied 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 base 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, 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, 2003 Ten Year Forecast 145).

If American and African blacks are able to make the requisite social and commercial linkages, effective use of technology can be an important strategic asset, even in the face of poverty. As such, the former victims of the digital divide will begin to take charge of what José Ortega y Gasset calls their "own program."

Chapter Seven

Conclusion: Comprehensive Human Capital Reparations

Chance favors only the prepared mind.

-- Louis Pasteur

This project has shown how persistent social and economic inequities besetting a poverty-stricken underclass, further stratified by race, continue to be exacerbated by new generations of technology. The examples offered here are taken from the gaps in access to and mastery of Information & Communications Technology, also known as ICT, as it relates to productive economic, educational, and political participation in the twenty-first century United States. It is critical to provide the modern 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. However, mere computer-based access to public services, though required, are insufficient to provide equal opportunities for one to become a fully capable participant in either the modern American democracy or the global economy. In the case of the 'digital divide,' distributive compensatory justice for African-Americans in the digital era entails fulfillment of a set of requirements for *human capital development*, not just meaningful access to the new digital infrastructure. Reparations in human capital development would allow the African-American poor, as indicative of the needs of the chronic poor in general, to have a fairer opportunity to fully participate in economic, educational, and political life.

The Enabling Power of Technology

Much of the relevance of science to society arises by way of technology. 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" (117-118). Note VIII provides additional philosophical perspectives on the evolution of technology. [viii] As an amplifier of human capabilities, Information & Communications Technologies are tools to help implement our social program.[42] 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).

[42] 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).

As a tool of culturally influenced decisions, ICT can amplify a poorly thought out program as well as a brilliant one. 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 that might relieve the symptoms, but do not demand changes in human values or morality, which ultimately affect many underlying causes (Meadows 155-159).

Human Capital Development and the Digital Divide

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. Since tools have no abilities of their own, the intended or unintended consequences of the human program are our collective responsibility.[43]

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. 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 sustaining priorities, such as health, 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. As such, 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. Distributive justice and John Rawls' Difference Principle can be valuable tools in helping one to re-examine and redefine moral responsibilities and obligations in an era of technologically-enabled global socio-economic restructuring..

Perpetuating the various social divides in an era of intensive technology-enabled 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.

[43] 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). As such, technology has been driven by society since the earliest of recorded history.

The African-American Poor as a Proxy for the American Poor

While the 'digital divide' impacts an underclass of poor people of all races and ethnicities, the case of African-Americans is both easily identifiable and of historical significance. This project assumes that if one is willing to examine the structural impediments of blacks, then it may be easier to understand the less obvious structures that impede the poor in general. In addition, color-blindness, though admirable in some respects, ignores reality and allows the culpable to escape responsibility for being part of the solution. As Loury states it, "Liberal theory, as it has come to be practiced, gives insufficient weight to history – especially to the enduring and deeply rooted racial disparity in life chances characteristic of American society" (Loury 7).

Consider that of the 37 million people in poverty in the U.S. in 2004, African-Americans comprised only 12.3 percent of the population but they were 24.9 percent of America's poor (The Urban Institute using 2000 U.S. Census data). As the Brookings Institution notes, the concentrations of black poverty seen in New Orleans in 2005's Hurricane Katrina disaster can be found in 46 of the 50 largest American cities. For example, the concentrated poverty rate among blacks in Miami was 67.6 percent, Louisville 53.2 percent, Fresno 44.9 percent, New Orleans 42.6 percent, and Atlanta 41 percent (Berube 3-4).

These extremely poor, racially segregated neighborhoods did not appear by accident. Governmental policies contributed to these imbalances. "The federal Interstate Highway Act, for instance, literally paved the way for suburban growth and central city decline," cites Alan Berube and Bruce Katz of the Brookings Institution (5). As a result, the suburban population and its associated jobs grew at 60 percent between 1970 and 2000. Only 17 percent of metropolitan populations works within three miles of downtown. This job decentralization exacerbated the concentration of poor in the inner cities. "The Federal Housing Administration 'red-lined' inner city minority neighborhoods and private lenders followed suit, denying these areas access to private-sector capital needed to fuel housing markets. Even today, federal state, and local transportation, tax, and regulatory policies continue to favor high-income suburban development over investment in urban neighborhoods" (5).

Government policies have also concentrated poor households in large developments in poor central-city neighborhoods. "Local governments still deploy their planning powers to prohibit affordable housing development within their borders, keeping these families locked into distressed parts of the metropolis." Berube and Katz summarize, "The history of concentrated poverty in America, then, has seen government vacillate between benign neglect and outright hostility towards these distressed neighborhoods and their residents. As a result, generations of families have suffered the deleterious consequences of growing up and raising children in neighborhoods that inhibit educational, labor market, and wealth-building progress, and that takes a heavy day-to-day toll on their basic quality of life" (5).

Racial inequities have occurred under the influence of the peculiar relationship of social behavior, customs, expectations, laws, and self-fulfilling prophesies that have a particular American character. These unfair actions have disproportionately harmed African-Americans, as a group, by enforcing an inferior starting position in a number of critical technologies, from their enslavement by superior military technology, to their role 'feeding the machine' of King Cotton, to their late arrival to the industries of the North (McGinn, Science 118-121). Now a relatively large percentage of the group risks further marginalization due to the requirements of a technologically-intensive globalized information society.

Civil Rights Implications of the Digital Divide

The political euphemism 'digital divide' is not 'digital' per se. It is a socio-economic divide further amplified by digital technology. The Arizona Democratic primary may have violated the spirit, if not the letter, of the *Voting Rights Act of 1965*, which prohibits "any standard, practice, or procedure different from the standards, practices, or procedures applied under such law or laws to other individuals within the same county, parish, or similar political subdivision…that deny the right of any individual to vote in any Federal election… or employ any literacy test as a qualification for voting in any Federal election" (Wright 588-589). Inadvertently, or perhaps indifferently, Arizona allowed a practice that enfranchised one group more and, by virtue of computer voting for the technically literate, applied a literacy test that disadvantaged some citizens.

Title VII Section 703 of the *Civil Rights Act of 1964* requires equal employment opportunity and forbids employment discrimination based on race, color, religion, sex, or national origin.

However, today, information and ideas from workers are the strategic resources that improve productivity and are the bases of employment. The result is that the segments of the American population, such as the poor opportunity-deprived African-American segment that lack education and skills for the new technology-based economy are not able to effectively compete for employment or develop the entrepreneurial businesses that take advantage of this new global ICT-based infrastructure.

In many cases, they are competing globally against, for example, a 300 million-strong Indian middle class cadre of literate highly-trained professionals with a low cost structure. Indians are successfully competing for outsourced global knowledge work, not just because they have access to the ICT technology, but because trained, literate, English-speaking doctors, accountants, engineers, and software developers are able to use the technology. As one can see in the example of Indian entrepreneurs, the 'real' digital divide is not about the just distribution of computers. It is about their ability to seize the opportunity for economic and social development in a technological society.

If literacy and abstract mathematical and logical thinking are prerequisites to advantageous use of computerized information tools that are increasingly required for economic and democratic participation, the U.S. still has a significant inclusion problem when it comes to poor citizens of color. *Brown v. Board of Education* established that the legal right to equal education fundamentally prohibited separate black and white schools. Though the U.S. public school system was legally desegregated over the past 50 years, de-facto segregation persists along economic lines that are determined by historical racial inequities. As presented in this book, high-quality educational programs can and should certainly include innovative use of computer-based learning techniques, globally accessible digital libraries, and multicultural collaborative learning methodologies; however, technology alone cannot ensure educational success. As seen in India, people working with computers are articulate and literate, and they have the confidence that ICT is just another tool to help them perform their jobs. Lawyers, engineers, librarians, medical professionals, and Indian call center operators all use the computer with ease, not because their academic training is similar, but because their basic communications skills are well developed.

Reparations in the Digital Era

Therefore, repairing the social divide for African-Americans in the digital era, including effective compensation, damages, amends, reimbursement, or restitution, may require that 'programmatic digital-era reparations' be part of any comprehensive solution to the racially influenced cycle of poverty that has been further intensified by technology. Rather than financial transfers, these reparations in human capital development may need to take the form of broad-scale affirmative action programs of a generation ago.

Affirmative action has been derided in the current era of neo-conservative thinking. Even liberals and the black intelligentsia go out of their way to find a more politically-correct way to refer to what the words 'affirmative' and 'action' imply. In the U.S., the phrase implied an 'active effort' to improve employment and educational opportunities for minority groups and women as a remedy to the acknowledged effects of long-standing discrimination.[44] It consisted of policies, programs, and procedures that gave preferences to minorities and women in jobs and education, when other academic and skill-based qualifications have been met. Since *Regents of the University of California v. Bakke* (1978), [45] in which the U.S. Supreme Court declared affirmative action constitutional but invalidated the use of racial quotas, and the 1997 Supreme Court refusal to hear a challenge to California's 1996 *Proposition 209*,[46] which barred race- or gender-based preferences in school admissions, public hiring, and public contracting, the trend of affirmative-action programs has slowed and sometimes been reversed by government, educational, and business leaders.

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[44] "Affirmative Action." Encyclopædia Britannica. 2006. Encyclopædia Britannica Premium Service. 3 Jan. 2006 <http://www.britannica.com/eb/article?tocId=9003914>.

[45] "Bakke decision." Encyclopædia Britannica. 2006. Encyclopædia Britannica Premium Service. 7 Jan. 2006 <http://www.britannica.com/eb/article?tocId=9399773>.

[46] "Developments in the States, 1997." Encyclopædia Britannica. 2006. Encyclopædia Britannica Premium Service. 7 Jan. 2006 <http://www.britannica.com/eb/article?tocId=92205>.

In an effort to be 'race-neutral,' the U.S. has become 'race-indifferent,' indeed 'race-hostile' in its avoidance of obvious inequities. Loury describes race-indifference as, "…a disregard for the effects of a policy choice on the welfare of persons in different racial groups" (Loury 166). The country not only ignores the fact that programmatic educational, governmental, and business outreach efforts resulted in a tremendous quantitative rise in the educated black middle class, whose members benefited from the affirmative action programs of the 1970s and 80s, society individualizes the achievements of accomplished blacks while generalizing the negatives that stigmatize the overall racial group. U.S. society forgets that, since 1980, affirmative action has contributed to a 57.2 percent increase in the number of people of color enrolling and graduating from colleges and universities.[47] Although it is generally well-accepted that the achievements of Dr. Condoleezza Rice, General Colin Powell, CEOs Chenault and Parsons, and astronauts Bluford and Jemison were due in large measure to their superior individual capabilities, the society often forgets that their skills may not have been tapped by their organizations had it not been for the proactive search for qualified minority candidates inherent in 1970s affirmative action programs.

President Lyndon Johnson explained the rationale behind the use of affirmative action to achieve equal opportunity in a 1965 speech: "You do not take a person, who for years, has been hobbled by chains and liberate him, bring him up to the starting line of a race and then say 'you are free to compete with all the others,' and still believe that you have been completely fair." This is the situation African-Americans, indeed the chronic poor of all races, face in the new era of technology-enabled global capitalism.

To break the cycle of constantly starting on the lowest rung of each technology advancement, African-Americans need a twenty-first century updated social contract to fairly distribute the benefits of ICT to those most negatively impacted by it. 'Fairly' in this context does not just mean 'equal.' As we have seen in Arizona, equal does not necessarily produce fair and relevant benefits when various sectors of society have neither equally skilled access to public infrastructure nor the ability to utilize it on an equal basis. Reparations will need to be race-sensitive, rather than race-indifferent or race-neutral. In order to comply with the anti-discrimination spirit of the *Civil Rights Act of 1964*, non-users of computer technology might need to get assurances that employment applications will be accepted in paper-based, as well as electronic form and that automated résume screening tools do not eliminate them from consideration. Any new form of enfranchisement or new government program needs to conform to the spirit of the *Voting Rights Act of 1965* in which ubiquitous access is guaranteed before any face-to-face or paper-based services are withdrawn.

The most important aspect of a reparations system will likely be one that gets serious about a wholesale upgrading of literacy, logical thinking, mathematical skills, research, and entrepreneurship demanded by a twenty-first century economy and educational system for both children and adults. Only then will computer-based tools be relevant to the day-to-day needs of the poor.

Whereas some believed that 1980s-type affirmative action programs gave manufacturing jobs or college placement slots to one group at the expense of another, Jeffrey Sachs suggests that the entire world, including today's lagging 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).

Sachs' optimistic view of technology's potential not withstanding, 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, although it requires technology implementation in an appropriate social context that enables all members of society to compete on equal terms for those new opportunities. So, regardless of how low one stands on the economic ladder, technology cannot be ignored and, as a matter of distributive justice, people cannot be denied access to it.

[47] According to the Leadership Conference on Civil Rights Education Fund.

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

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Notes

[I] **Global Perspectives on the Digital Divide**

In 2005, 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" (The Economist 22).

The conservative school of thought argues 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. 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 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 governments have a role to assist where markets alone are insufficient or disinterested.

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. They believe that 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. They believe that it is unethical to spend scarce resources on Information & Communications Technologies (ICT). 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 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.

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 (1).

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 U.S. 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 U.S.$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).

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." As such, 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).

Will large-scale technology 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 may not be 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. According to the Organisation for Economic Co-Operation and Development (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 8). Access problems can include not only electricity, infrastructure, and computers, but also skilled users and content. Moreover, according to the United Nations, ICT does not stand alone. The impact for human resources development comes from integration of ICT into other efforts, with adequate financing and skills from various quarters (UN 1).

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).

Senegalese President 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. 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 U.S. 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 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 and treatments available in the U.S. 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. 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, Paul 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 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). 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 9).

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).

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. As such, 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).

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 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 21).

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. As such, 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 OECD, 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 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, recycling, 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 (Somoggi 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 (Somoggi 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).

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 as such, government intervention is not warranted to close the digital divide.

However, 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 Tibirica. "Access to technology is fundamental in order to get full rights and opportunities in modern society", she added (Bacoccina).

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.

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).

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. As such, 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?

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, End of Poverty 258).

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.

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 9).

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).

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 egovernment 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).

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).

II Obsolete Educational Focus

The biggest problem with the U.S. 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 22-248).

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 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 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.

III 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 reactive 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. Further, Saxon 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, as Small sees it, 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).

IV Additional Observations on the Ethical Obligations of Technologists

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[iv] (Bronowski 71).

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 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 Schinzinger (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).

In recent times the engineering profession has moved beyond the question of <u>whether</u> ethics applies to <u>how</u> ethics should apply to engineering decisions. The profession needs 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, Robert 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 unrecognized 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, D. 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.

[v] 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 c ritiquing. 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 hav e 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/SIG CAS 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.

[VI] 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

[VII] 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

[VIII] 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 used the *Technology of Chance*, what Ortega called 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). 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).

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. 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 Lew is 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 synbook 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. 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).