“The Societal Consequences of Digitalization”

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I. Introduction

To address the societal consequences of digitalization, the first order of business is to give a new meaning to the definition of "society." Classically, the definition identifies and groups people who share geographic proximity within national or regional borders, and further differentiates them by economic status, ethnic background, age, etc. In this paper, we will observe new "digital" societies coalescing around access to and utilization of personal communications, computational resources and electronic consumer goods, all of which are born out of the digital revolution.

The most notable impact of the digital society is that it empowers the individual. This empowerment emphatically and undeniably changes his or her relationship to and dependence on existing social structures -- personally, locally, regionally, nationally and, for the first time ever, globally.

As for the rate at which these digital societies will emerge, that depends upon the actual rate of introduction of new and useful technologies throughout the world. There is constant debate as to the actual deployment dates of specific technologies into various societies. Adjustments to timelines must be made for a variety of reasons, not the least of which are manufacturing problems, undesirable price-point scenarios, insufficient communications infrastructures, political considerations, literacy levels, etc. Therefore, the timeline for future rates of change in any particular region or to any population may be open to question.

To that end, each reader is encouraged to utilize his or her particular first-hand knowledge of particular existing societies or regions, and to apply that knowledge to establish a likely introduction timeline. More important than the technical specifications of emerging products and services are the needs and priorities of specific groups of people. In the end, humans select the technologies they choose to incorporate in their lives.

II. Note on Author's Perspective

It should be noted that the author's primary experience deals with the United States. Therefore, it should come as no surprise that this paper will unavoidably have a certain U.S.-centric orientation, and the author apologizes in advance for that failing. At the same time, the U.S. is at this writing the most technically saturated society, both in numbers and in percentages of the general population, and it is currently in a lead position vis-à-vis Internet business worldwide.

While this state of affairs is likely to be temporary, readers are asked to remind themselves of the date of this writing as they proceed. Committing perceptions, current statistics and predictions to paper -- even electronic paper -- during a period of great change is a foolhardy proposition. Still, it is an essential exercise if we are to responsibly shape our future.

III. "Individualizing" Consumer Technologies & "Key Influencers"

The impact on the individual is first felt by the existence of what we term "individualizing" consumer technologies, i.e., those products and services which directly and immediately empower the individuals who have access to them. They are characterized by clear demand and acceptance in the marketplace, coupled with ready availability and a low threshold of affordability.

Since the availability of new consumer technologies, and the speed at which they are being introduced, is unprecedented, there is a natural inclination to try to overview these products and services. Nevertheless, there are numerous reasons to avoid this exercise.

First of all, it can be misleading -- a prime example of seeing the trees, but missing the forest. The is only underscored when one considers that any list of digital consumer products faces obsolescence in a one-to-four-month time frame.

In addition, while the presence of a consumer technology may fascinate us with its potential, that perception does not guarantee that it will be a "key influencer" with respect to societal change. An "individualizing technology" becomes a "key influencer" when it finally reaches enough people to change the way a particular society (or sub-society) operates.

Attempts will also be made to avoid corporate brand names, except in the case of emerging technologies for which brand names might enable the reader to gain a better comprehension of the basic functions involved.

IV. The Interdependence of Technologies

Since the single biggest predictor of societal change is the arrival of new technology, it is perhaps most important to understand that breakthrough technology products are seldom, if ever, the result of a single, isolated technical breakthrough. They are generally the result of a number of "elemental technologies" inching forward and finally evolving to a mutually beneficial point. Being mindful of the progress of elemental technologies is frequently the best determinant for the likely availability of new products in the future. For the reader's reference, some effort has been made to discuss how technologies converge. It can be found in Appendix I. The Laws of Technology Convergence, Version 1.0.

There is an oft-repeated saying in Silicon Valley: "It takes 25 years to be an overnight success." One example is the World Wide Web. Besides the Internet itself, the Web owes much of its success to affordable personal computers, color monitors and the all-important computer mouse. Take any one away, and ease of use, quality of experience and widespread penetration erode immediately. The Web simply would not have made its breakthrough into usefulness without the four elemental technologies listed above. Yet,

who correctly predicted the World Wide Web even though its four key technologies were well-known?

The next few years/decades will be exciting as new products and services emerge, existing elemental technologies improve and new elemental technologies become available.

V. The Digital Society

There are many benchmarks that might be used to help us understand the societal impact of digitalization, but it is the author's opinion that the most significant measure of digitalization itself is the worldwide penetration of the Internet.

While this may appear to ignore much of the other technologies in use today, the reach of the Internet requires and/or indicates the presence of other ancillary technologies. At its base level, Internet penetration reflects the spread of personal computers and the existence of a robust telecommunications infrastructure, as well as other consumer technologies such as cell phones, pagers, voice mail, etc.

Still, Internet penetration is a moving target. We are currently experiencing what will go down in history as the "Great Internet Roll-Out," and we will not know for many years just where in this emergence we currently are. The profile of societies where the Internet has made the greatest inroads today, are reporting 40% or more usage in the general population, and over 50% use in the adult population. At the same time, there are other societies which appear to have begun a period of rapid rise, i.e., moving in a 1-2-3 year period from just a few per cent of the total population to 10%, 20%, 30% or more. There are still other countries where only a few per cent of the total population have Internet access, and there is no apparent rise predicted for the foreseeable future.

We might call these three types of societies: (1) Pre-Internet, (2) Internet-emergent and (3) Internet-integrated. The impact on society is clearly different in each. Presuming that essentially all will eventually become Internet-integrated, the ultimate impact on these societies may well be more similar than not.

Please note that no society today is (4) Communications-saturated, where the use and integration of the Internet and all-point communications cease to be observable as separate from the information or function they deliver. A communications-saturated society might be described as "Internet ubiquitous." While no society is communications-saturated today, it appears to be the inexorable result of the current technology wave and the ultimate outcome of the telecommunications revolution.

One earmark of a single aspect of communications saturation is that most of the world, independent of socioeconomic status, is television-saturated. And when a person watches television, he reports on the program he watched -- not the name brand of the television set he used, or whether it came through cable, broadcast or another

communications medium. The technical delivery mechanism is of no importance to the user of the technology.

In review, the four(4) Digital Societies are:

(1) Pre-Internet
(2) Internet-emergent
(3) Internet-integrated
(4) Communications-saturated

While these are analyzed herein as being broken down on a national basis, lower socioeconomic populations are generally unable to participate at this point in time, and the usage numbers necessarily reflect use by the highest social and/or business class.

VI. Worldwide Internet Penetration

With regard to Internet penetration worldwide, a compiled set of statistics has been extracted from NUA Internet Surveys. Their sources include such reputable organizations as IDC, Gallup Media, CommerceNet Research, ITU/Siemens, Osservatorio Internet Italia, the Russian Non-Profit Center for Intrenet Technologies, CNET, Reuters, Media Africa, Xinhua News Agency, DIT Group, Swisscom, and Nielsen. This source has the further advantage in that it available in the World Wide Web at www.nua.com for anyone seeking more detailed information, and it is constantly being updated.

The reader is reminded that these are estimates and may provide numbers which may be over-estimates or under-estimates, or both. For example, some surveys only record adult usage, while others count every member of the family, age 2 and older, where the household has access to the Internet. Adults accessing the Internet while at work and using work-related online accounts are seldom separately tracked to determine if they also utilize the Internet from home. And with over 90% in the U.S. schools providing access to the Internet and numerous options for free email, the ability of U.S. students to access the Internet through their school or educational programs may or may not be accurately pictured. Also, in the United States, most public libraries provide free Internet access to the general public, and the utilization of this access is not known.

It may well be that the usage of the Internet may never become an exact science. People frequently maintain multiple email accounts, as well as share email accounts. The patterns for using the World Wide Web and other areas of the Internet may only be known over time, and are no doubt changing at this moment.

Even with all these caveats on the limits of the data available, a world picture of the utilization of the Internet reveals itself.

As of April, 2000, the worldwide penetration of the Internet is as follows:

AREA	COUNT	% OF TOTAL POP
Canada & US	136 M	app. 40%
Europe	72 M	11%
Asia/Pacific	55 M	<2%
South America	9 M	<2%
Africa	2.5 M	<1%
Middle East	1.3 M	<1%
Worldwide	275 M	app. 5%

While Canada and the U.S. have similar societal make-ups, and approximately the same depth of Internet reach (app. 40%), other geographic regions are more uneven in penetration and bear further examination.

The European nations in general have substantive Internet adoption or clear penetration into the population. Many of the countries that report a low percentage of Internet adoption have not reported Internet usage since 1997/1998. Given the rate at which the Internet can be adopted, these older statistics are noted and should not be considered an indicator of present penetration.

NATION	COUNT	% OF TOTAL POP	
United Kingdom	14 M	23%	
Germany	12 M	15%	
Italy	9 M	16%	
France	6 M	13%	
Russia (*)	5.4 M	4%	
Netherlands	3.8 M	24%	
Sweden	4.0 M	44%	
Spain	3.1 M	8%	
Norway	1.8 M	41%	
Denmark	1.7 M	34%	
Finland	1.6 M	32%	
Belgium	2.0 M	20%	
Poland	2.0 M	5%	
Switzerland	1.2 M (1998 est)	16%	
Turkey	0.6 M	1%	(1997)
Slovak Republic	0.5M	10%	
Hungary	0.5 M	5%	
Slovenia	0.4 M	23%	(1998)
Ireland	0.4 M	17%	
Austria	0.4 M	6%	(1998)
Iceland (**)	0.1 M	45%	(1998)
Portugal	0.2 M (1998 est)	<2%	(1998)
Greece	0.1 M	1%	(1998)

Estonia	0.2 M	5%
Czech Republic	0.1 M	2%

(*) While Russia has over 5 million users, its penetration is only 4% of the total population. This clearly points to a lack of broad-reaching effect on the society by the Internet and other ancillary technologies.

(**) Iceland is an excellent example of how remote and isolated communities benefit greatly with the Internet connection. Their 45% population involvement rivals Sweden for the most societal Internet penetration worldwide.

The Asia/Pacific nations which have substantive Internet adoption or clear penetration into the population:

NATION	COUNT	% OF TOTAL POP
Japan	21 M	14%
Australia	6 M	31%
China (*)	4 M	0.26%
South Korea	4 M	8%
Taiwan	4 M	19%
Hong Kong (**)	0.8 M	13% (1998)
Singapore (***)	0.5 M	15% (1997)
New Zealand	0.3 M	16% (1998)

(*) While China has an important 4 million users, its penetration is far less than 1% of the total population. This clearly argues toward a lack of effect on the society by the Internet and other ancillary technologies. Daily news reports of attempts to change Internet utilization need to be watched before their results can be posted.

(**) The Hong Kong figure is somewhat out of date, but this early Internet penetration coupled with the worldwide business impact of Hong Kong cannot be overstated.

(***) The Singapore figure is quite out of date, and does not reflect either the commitment of this nation to building an information infrastructure and a World Class Technology Region. It is presented here to ensure that it is not overlooked.

A sample of Asia/Pacific nations which have the <u>least</u> Internet penetration:

NATION	COUNT	% OF TOTAL POP

India	0.8 M	0.08%
Philippines	0.3 M	0.03% (1998)

In South America, Costa Rica has the largest penetration with only 30,000 users and 3.4% of the total population, while Brazil has 5.1 million users, but this figure reflects only 3% penetration.

In Africa, the leader is South Africa with 1.6 million users and 4% penetration, with the next strongest nation being Egypt with 0.4 million users and 0.6% penetration. Still, Egypt is an excellent example of Internet growth -- their online users doubled between May and June of 1999.

In the Middle East, the Internet is most prevalent in Israel with 600,000 users reflecting 11% of the population. The next strongest nations would be Lebanon with 0.1M users and 4% penetration, and Saudi Arabia also with 0.1M users but reflecting 0.5% of the population.

So, one might ask looking over this list, how is it that the Internet can penetrate so fast in some places and not in others? While that has been a subject of some discussion, let me suggest these points. First and foremost, the presence of the Internet requires a literate populace, economic conditions which enable purchasing power for these technology and a robust and diverse telecommunications infrastructure. Some also would list a government which is disposed to Internet-enabling businesses, since that places pressure on the telecommunications infrastructure, while others would not list the political climate separately.

One element that was once thought to contribute to the penetration of the Internet was the ability of the general populace to read and write English. While English is certainly the predominant language of the Web, there is no data available which informs us about how much of the usage of the Internet is tied to facility with the English language. And even if this should be a factor, the body of content for all languages is rising rapidly and may dissolve the issue before it can be studied.

What is clearly essential is that these figures be constantly tracked and constantly examined. We may learn that Internet-integrated societies may saturate at the current 40%-45%. Or we may find that number rising.

In looking at the recent five-year time period, Internet-emergent societies appear to take 1 to 2 years to become Internet-integrated societies, but that is only when all the elements for Internet penetration are in place. Let us take for example India, the largest English-speaking nation in the world. Today, it only reports 800,000 online, representing 0.08% of the total population. It may appear to be Pre-Internet, as one year ago it had only 70,000 online. At that time, the limiting factor was in fact the telecommunications infrastructure. In one year, the political situation changed and permitted that

infrastructure to explode. It is anticipated that within a few months over 3 million will be online. India is clearly Internet-emergent.

Staying with India for a moment, it is an interesting case in point. This is a nation where 400 million people live below the poverty line, at the same time that it has a large number of highly-skilled technical people. It may be that the Internet, as we know it today, can never penetrate a society like this in the same way it penetrates nations in North America or Europe, simply because of the profile of the population. Hence, in the years to come, it is likely that we will need to re-visit the definition of an Internet-integrated/communications-saturated society.

It should also be noted that Indian technical personnel are migrating in great numbers throughout all the technology regions worldwide, especially fueled by the Internet technology boom. A case in point -- since 1998, the United States has raised its annual level of three-year H1B visas to 115,000 through the year 2000, dropping to 107,500 for 2001 and 65,000 for 2002. The demand for these visas is clear, since they have already been exhausted for the Year 2000 and the Immigration and Naturalization Service will not accept new applications until Fall of 2000 for the year 2001. At this writing, three different pieces of legislation attempting to increase these visas are before the U.S. Congress.

The societal impact of the global migration of high-tech workers cannot be immediately ascertained in a cross-cultural and multi-national sense, especially we cannot currently predict where these migrations will be temporary and where they will be permanent. As hard statistics become available, these migration trends will certainly be of interest in the coming decade.

All of these trends may relate to the evolution of the Internet itself. One resource available for future study on this topic is the deep electronic storage archive services of the not-for-profit “Internet Archive”, located in the Presidio of San Francisco, and its companion organization, Alexa Internet. This data is intended to facilitate study of the different types of usage of the World Wide Web, and since 1997, the Internet Archive has recorded all pages available on the World Wide Web, and their related links. While the private sector is always interested in buying habits and consumer influencers, there is much more to be gleaned from this data. They include analyzing the effects of the Internet on national and local politics, observing the usage profiles and consequences of Internet addictions, tracking the efficacy of grassroots, albeit global, environmental movements, and documenting the erosion of the power of broadcast media.

Finally, it should be noted that Internet penetration is an imprecise measure at best, and only reflects the embodiment of the technology as we know it. Today, the Internet requires literacy and economic wherewithal. From a marketing standpoint, “Everyone can drink Coca-Cola, but will everyone have a use for the Internet?” Should the necessary levels of economic wherewithal and literacy be diminished, the ultimate penetration will be greater. And even if this does not bear out, in a communications-saturated society, even the most isolated individuals will sustain some effect.

VII. "Digital Society Personas"

Since the information age inevitably leads us to the rise of the individual, we might best view individuals by way of "Digital Society Personas", each of whom relates to technology and participates in society in a different way.

In the United States, one way is to break out these personas is to consider the various generations of Americans. Each generation tends to hold its own values and uses technology reflecting that value structure and the life stage they are currently experiencing.

One basis for this is proposed by J. Walker Smith, the Managing Partner of Yankelovich Partners and an expert in marketing and social trends and their impact on business. In his 1997 book, "Rocking the Ages … the Yankelovich Report on Generational Marketing", and in his continued research, he proposes a breakdown along these lines: "Matures", who would have been born in 1945 or earlier, "Baby Boomers", who would have been born between 1946 and 1964, reflecting the post-World War II escalation in births, and "Generation X-ers", who were born from 1965 to the present.

Combining that with the work of Don Tapscott, the author of "Growing Up Digital … the Rise of the Net Generation", for the purposes of this exercise, we'll re-define Gen-X-ers to be born between 1965 and 1979, and make a fourth category, "Echo Boomers", (or Tapscott's term, "Net Gen's",) who were born since 1980. This generation has been called the "Echo Boomers" since they are primarily the offspring and therefore the "echo" of the Baby Boomers.

For societal purposes, it's important to distinguish those young people who have already gone out, found work and possibly started families, from those teenagers and children who are still essentially at home, or at least, full-time students. With a nod to both of these gentlemen's efforts, we'll borrow and modify these terms simply for the purpose of this working paper.

Additional Note: Stratifying society another way, there is a huge difference between technically-savvy adults whose economic status affords them every technology available, and modestly-technical workers and/or low-skilled, economically-challenged workers. There is a similar difference between teenagers with powerful personal computers with Internet access readily available at home and at school, and those who don't. The lower the economic scale, the less impact technology has. Whether this technology gap is a temporary situation, or simply the standard historical trend that new technology is always available to the economically advantaged first, is a question of great debate and remains to be seen. This issue will be addressed periodically throughout the remainder of this paper; however, the general focus shall be upon the impact on those who have, for whatever reasons, incorporated these technologies.

In review, the four(4) Digital Society Personas are:

(1) Matures
(2) Baby Boomers
(3) Gen X-ers
(4) Echo Boomers

VIII. Today's Ubiquitous Personal Technologies

There are certain technologies that permeate economically-hearty societies, which don't require a tremendous amount of skill and which clearly carry substantive societal impact. These technologies include television, radio and the telephone. Their impact has been felt for decades, but even they are evolving. Certainly, more channels of television and radio are available than ever before, and the fact that the telephone can be mobile changes the ability of the individual to utilize it.

One example of an advancement in the basic function of television would be a feature wherein the remote control for your TV would permit you to gain more information about an advertisement you are watching by simply punching a button. And ordering through the same mechanism would also be possible. But the real question is, is it really viable? Or even likely?

A more likely scenario would be that radio and television are delivered in wireless fashion in a mode that is customized to the needs and desires of the individual. This profile serves the individual, as opposed to business.

At the same time, it seems highly unlikely that any of the "useful functions" which these technologies represent today would go away altogether. Clearly, they will evolve. How they will evolve will in fact be up to the needs and desires of the consumer.

IX. Mobile Personal Digital Technologies

Nothing has changed the life of adults worldwide more than the emergence of mobile personal technology. A combination of communications and computer technologies, they provide useful functions which are transforming lives in urban, suburban and rural settings.

The most popular new technologies are: cell phones, voicemail, pagers, email, Personal Digital Assistants (PDAs) and laptop computers, all of which are linked through the Internet and telecommunications networks.

So what is the impact of this on the individual? As before, a person continues to interact with family, friends, community, work associates, etc. What is different in these interactions is the shift of "time" and "place".

Basic telephone service used to require that two people know the physical location and time considerations of one another. With voicemail, an effective message

can be left, and interactions can proceed without having to actually speak directly with the person. With a pager, notifications from simple alerts to complicated alphanumeric messages can be provided. While there are incompatible cell phone standards within Europe and the United States, a person can be dialed and located at any time and at any place within either continent. The combination of the technologies of cell phone and voicemail enables everyone from a businessperson to an everyday mother and housewife to be accessible. Perhaps even more important, it enables people to have more mobility in their personal and work lives.

The laptop computer and the Internet have had the most impact on the lifestyles of businesspeople. Together with the mobile voice communications technologies, they can easily transit between work, home and client offices, as well as out of town, seamlessly. Many solo entrepreneurs maintain their entire businesses on a single laptop computer.

Whether an employee of a large international corporation, or a single person running a home business, the result has been a blurring of the boundaries between work and personal life. No single reference examines this more closely than Sue Shellenbarger's book, "Work and Family," an offshoot on her regular Wall Street Journal column of the same name. One can see that this is especially true for the Baby Boomers. With families, jobs, homes, etc., this generation of some 80 Million strong are at the top of their careers and at a life stage which is perhaps its most complicated. Middle and upper income Baby Boomers have adopted these technologies at an astounding pace.

This is closely followed by Generation X, a generation whose values carry a more socially responsible element and who have observed the adult Baby Boomer life experience. Gen X-ers use these same technologies to structure lives which will allow them and their planned, or newly-started, families to spend far more time at home and with each other than any modern-day generation. Many work from home, or ultimately plan to. And many use these technologies to stay in close contact with their friends, families, co-workers, etc. These technologies are almost second nature to them, and they expect that these and subsequent evolving technologies will be available and affordable. As a direct result, the Gen X-ers expect to have a great deal of choice in how they structure their lives.

Matures have adopted these technologies on an uneven basis. At the same time, they are now at a life stage which is much less demanding from a communications standpoint than earlier ones. The Echo Boomers use whatever technologies their parents, their schools or their after-school jobs will provide. Pagers have been the most popular technology, although they have been banned in many U.S. schools due to problems with illegal drug sales and the like. In the United States, cell phones are beginning to make inroads with teenagers given the new "family" plans being offered with multiple phones on a joint plan. Cell phone usage in this age category still trails certain other developed countries, such as Israel; however, penetration is conjectured to be simply a matter of time.

A simple way to look at the generational effect is described by Stanford professor, Kathleen Eisenhardt, author of "Competing on the Edge … Strategy as Structured Chaos". She asserts humorously that she can tell a person's age by their preference of communications. Under 40's love email. Under 50's love voicemail. Over 50's shout "Where is my assistant?" Since time marches on, she may well be inclined to update those age categories, but her point is made. There is a tendency to embrace the technology of your youth, and later on adopt only that which is easy to incorporate and truly makes your life better. Resistance may only be a "mindset", but taken as a complete generation, it can represent enormous resistance to an otherwise completely acceptable product or service.

Resistance, of course, may represent only a temporary condition. Fourth Quarter, 1999 marked a turning point in U.S. history. At that time, it was first realized that over half of all American adults had access to the Internet. Simply speaking, more adult Americans were using the Internet, than not. Clearly, the Internet became a key influencer of society at large.

Adding to this, numerous mobile technologies designed to access the Internet have been announced or are on the drawing board. This ranges from email access through cell phones, to application-specific Web appliances. The most recent as of this writing was announced by Steve Case, Chairman and CEO of America Online. No fewer than three separate devices were in planning, each under $500 and each providing access to the Internet within the home environment. One is a flat-panel display with touchscreen, meant for a kitchen or family room. Another is a larger unit with a keyboard, mouse and a more typical display, serving as an alternative to an extra PC for the household. The third is a wireless Web pad, which could be moved anywhere in the house, much like a cordless phone. Each is expected to be delivered some time in the next 12 months, and since none have the ability to store information or print web screens, there is real speculation as to whether they will in fact be ultimately popular.

But the question is: will the impact of the Internet on society be greater if there are 5-15 ways for a single individual to get to the Internet? Or will it simply mean an increase in convenience in using the Internet? With no commensurate increase in impact?

Additional Note: Much has been discussed in both research and product development terms of a generic hand-held "information appliance" which does everything you might ever need. While combining all useful functions into a single device has its obvious drawbacks, the idea that one might do such a thing carries us into a "design orientation" which is useful to bringing about new useful functions and a better user interface. While many believe that generic information appliances will ever be universally workable, the effort to create such, as well as the meaningful creative thought which that exercise engenders, will no doubt yield results for all technology.

X. Other Personal Digital Technologies

When it comes to other digital technologies that affect the individual, three primary technologies are foremost:

(1) Desktop personal computers & workstations
(2) Wired communications into the home,
(3) Embedded chips and associated networking

The 1980's and 1990's prepared us all for the idea that local computer power, local data storage and network interconnection were possible for every individual. The most localized computing power today comes in the form of a desktop workstation with attendant data storage. It can be most powerfully connected, with the highest speed and greatest reliability through local hard-wired communications. (The term "hard-wired" is used to refer to any networking technology that is not wireless.) As we proceed, all of these expectations with continue. What will change is that the desktop will likely drop away as a separate category.

When we trace the history of computers, they have evolved from large mainframes, to mini-computers, to personal computers, to laptop/notebook computers, to embedded chips. We are at the stage in history where everything but the embedded chips are interconnected, and the networking of the embedded chips is emerging now.

At this time, desktop personal computers and wired communications in the home bring a better Internet experience, although they do not appear to bring a defining one. The World Wide Web screens come up faster, but that level of interconnection may be not necessary to lure Internet usage. It only increases its desirability.

So, it may well be that the desktop computer, as we know it, will only have a short life span. In a "space footprint" sense, what will remain is that humans need the ability to view information and to interact with the system or network. The former may require a screen of a certain size, while the latter may require keyboards, mice, and more esoteric interaction devices. What is clear is that, with sufficient communications bandwidth, the ability to store and retrieve information, and process information, need not be local to the user.

Today, we take our laptops when we fly across the U.S., which means we take our screens, keyboards, mice, data storage and processing power with us. What if the available bandwidth were such that anywhere we went we could use a variety of local access resources, not only to reach the Internet, but also to securely access and utilize our resident data storage and applications capabilities.

So this brings us full circle. First, the technology is stationary. Then the technology becomes mobile. And ultimately, the individual can utilize remote technology while being mobile, and the basic technology in fact may well become stationary again.

XI. Other Digital Technologies

There is one more place where digital technologies have tremendous impact on the individual, and by extension, society, although these are technologies that the individual does not use as part of his or her everyday life. The technology in question is large networks of computers, and their associated databases. These systems may be corporate in nature, or governmental, or NGO-based. Regardless, the fact that these systems exist brings changes to society.

Samples of a negative perspective about these systems are that they may collect information about the individual without the individual's full knowledge and permission. The sources for this data can occur when an individual uses the Internet, makes a credit card purchase or a telephone call, comes into ownership of land or a home, registers to vote, or simply asks for information. Even worse, these systems may contain incorrect or incomplete information, which can have serious consequences for the individual.

Samples of a positive perspective about these systems are that they enable the existence of large and well-traveled Internet sites such as Amazon, Yahoo, CNN, the BBC Worldwide, America Online and the multi-faceted Web sites of the U.S. government. From a commercial perspective, the ability of currency and financial instruments to flow enables a functioning global economy, while the ability to track and service transportation enables worldwide agriculture, manufacturing and other global industries. From a social perspective, national and international criminal activities can be cross-referenced, and international relief and peace efforts can benefit from the most advanced technologies.

No matter what, the result is the same -- more and more data is being collected about individuals, and the impact of that data collection is not well understood.

Additional Note: Large mainframe computers are still in production and serve a large number of applications, including such examples as national/international credit card processing and financial/banking transactions. Many new applications have a comparable transaction/database access aspect, but they are not being developed for mainframe systems. A prime example is any large transaction-based Internet Web site. They are designed to grow simply by adding more workstations/servers to the in-place network. One popular Web site has a 3,000 server network. In the past, these applications would require custom applications to be built on large mainframe computers, but the new "scalable" computer network architecture obviates this need. Additionally, we can anticipate that classic mainframe applications will all eventually migrate to multi-computer networks. Again, the mainframe-sized application need is not diminishing -- the implementation hardware of choice is being replaced.

XII. General Societal Issues

Some of the most obvious areas that characterize change in digital societies are:

A. Life as a 24/7 Proposition
B. The Emergence of the Tele-Commuter & the Home-Based Business

C. The Changing Nature of Work
D. Education
E. Entertainment
F. Privacy
G. National/International Intellectual Property Rights
H. A Changing Role for Government

While the general nature of business, and changes in so far as the individual, are referred to herein, the special changing nature of business, and the explosion of "eBusiness" in particular, are not addressed in this working paper.

XII.A. Life as a 24/7 Proposition

The most overt aspect of daily life in the digital society is the blurring of time and place boundaries that limit/determine personal behavior. The result also blurs the boundaries between work and family life, or more generically, the public and private aspects of an individual's life.

In previous sections, we have already covered the impact of individual consumer technologies and the penetration of the Internet. When both are combined, a person's relationship with his or her environment can change dramatically. Let's look at a few simple examples.

Prior to the Internet revolution, if the average working person needed to simply purchase a book, that would be restricted to lunch hours, or after work or weekends during bookstore business hours. And it would require a physical trip to the store. Today, within a few minutes, any book can be ordered online and sent to the person's home or office. Some services in urban areas can deliver in person within hours or even minutes. And while there are shipping costs incurred, most online book sales are heavily discounted. Extrapolate this to many goods and services, and you will find the key to changes in how one organizes one's personal time. Since consumer goods enjoy heavy competitive discounts and the Internet carries with it the advantage of readily-available customer information and service 24 hours per day, this can be expected to be mainstay of the digital society.

Applying the laws of technology convergence, it is clear that business has obvious economic incentives to build new and cheaper technologies which shall bring this online purchasing capability into places where anyone can incorporate this purchasing approach without having to buy a personal computer and sign up with an Internet Service Provider. Solutions also must address the socioeconomic barrier of the need for a credit card.

At the same time, the potential for economic decline in local, regional and national "chain" businesses remains to be seen, and then there is the impact of these new Web sites on local neighborhoods. One example where a projected decline failed to materialize is in the area of used and rare books. The ability of used and rare bookstores to thrive depends upon their network of contacts. Many of these stores can now operate

worldwide with the presence of the World Wide Web, and many of these booksellers can also have alliances with large consolidators of used books. The result is that the physical store's revenues may only comprise a portion of the total revenues for the store, while the Internet may account for 20%-60% of the revenues. The Internet component actually underwrites the existence of used bookstores in the neighborhoods where they are physically located.

Looking at the personal challenge of time management, prior to the personal technology/Internet revolution, a person was only at work when he was physically at his "place of work". Even when someone has an office and actually spends most of the workweek there, the existence of these technologies extends the expectation of how and work is done beyond basic business hours. It is expected that the person might be available at night or over a weekend. Email, whether for simple communications or major contracts, is expected to have fast turnaround, and work is considered so important, that people are often routinely expected to check their voice mail, email, pagers, etc. even while on vacation.

The picture of the driven employee was once someone who was at work so much he had no time for his family. Today, the picture of the driven employee (or shall we say "committed" employee) may be male or female, and with personal technology, may appear to be with their families, but for all practical purposes are unavailable. The impact on family life and personal relationships remains to be seen, but once again the challenge to the individual is that he or she must now decide what boundaries to impose on his or her life now that so much is possible.

On the positive side, there has been a strengthening of the bonds of family now that email can connect people who normally could not do so, either due to distance or to the vagaries of time schedules. A simple everyday example is a sister and brother that I know. The former is the harried mother of small children and the latter, a busy executive 2,000 miles away. She reads and responds to email some nights after the children are finally in bed, while her brother reads and responds during his lunch hour, whenever that happens to be during his busy day. These ties would well have diminished without the existence of these personal technologies.

Similarly, a retiree in Silicon Valley has suffered from progressive deafness, to the extent that it is difficult for him to speak on the telephone and he no longer listens to radio or watches television. Yet, today, because of the Internet, he is in constant communication with his daughter and grandchildren in Austria. The improved communications is primarily a result of moving their communications to a visual medium.

Still, the effect of the use of the Internet on the individual is hotly debated, and surveys vary widely. In a Reuters' wire service story, Stanford Professor Norman Nie commented on his survey of 4,000 adults in 2,000 homes. He said, "Internet time is coming out of time viewing television but also at the expense of time people spend on the phone gabbing with family and friends, or having a conversation with people in the room

with them. … E-mail is a way to stay in touch, but you can't share a coffee or a beer with somebody on e-mail or give them a hug. The Internet could be the ultimate isolating technology."

This contrasts with a recent study by the National School Boards Foundation that looked at the effects of net usage on children and their families. “Ninety-five percent of the parents surveyed said family interactions have either increased or stayed the same, despite Net usage.”

Other concerns such as cyber-addictions are just beginning to be observed and clearly require further examination. And while examples of how this affects family life are numerous, they are, at this stage, primarily anecdotal. The methodologies for these types of studies and surveys are relatively new, and they will no doubt be refined over time to ensure that proper behavioral measures are in place.

Nevertheless, all indicators point in one direction: time and place are becoming less important to human relationship, and the obvious advantages of the Internet may also carry hidden downsides.

XII.B. The Emergence of the Tele-Commuter & the Home-Based Business

There’s no doubt that the personal technology revolution has enabled people to work from home. The National Association of Home Based Businesses (NAHBB) of the United States estimates that in the year 2000 over 55 Million people will work, either part-time or full-time, from home. Of these, NAHBB reports that “about a third [16.5 - 18.5 million] are estimated to be home-based businesses.” In fact, “the U.S. Commerce Department reported in 1998 that more than one half of U.S. small businesses are home based. Home managed businesses are the fastest-growing segment of the U.S. economy, with an annual growth rate of 10%.”

From a societal point of view, it is important to distinguish the “tele-commuter” (i.e., an employee working partially from home during normal business hours where they once always traveled to their place of work) from the home-based entrepreneur, who literally operates a business from home. A tele-commuter depends upon an outside employer for employment, while the home-based entrepreneur actually operates an independent business.

While both enjoy the personal benefits of increased time at home, the home-based entrepreneur has an even greater reward in the form of no mandatory retirement and greater flexibility of time schedule. The potential for creatively structuring family environments for Generation X and elongating careers for the Baby Boomers and Matures remains to be fully explored, but promises to impact society greatly.

And besides the impact on the infrastructure of the family itself, William Mitchell, Dean of the School of Architecture at MIT, and author of “E-Topia”, foresees a

movement of families back to urban areas and small neighborhoods where support for technology and services are readily available close to home.

XII.C. The Changing Nature of Work

The use of computers within the workplace has become commonplace. According to a study by Market Research Associates, a survey of 850 Southern California businesses showed that 85% used email. This compares with national averages of 50%-60%, a figure which is growing constantly. In fact, over 300 million emails are sent every business day. Add to this the growing use of mobile laptop/notebook computers and personal digital assistants, and no one would argue that the ability to easily use computers is almost essential for employment. Still, even employment which is considered entry level and requires technical skill is not without the burden of technology.

Take, for example, the position of counterperson at an established chain of fast food restaurants. Every part of an order is entered on a preprogrammed keyboard. One key for hamburger, another for special hamburger, another for some special combination, and then there are drinks and other elements of the order. Depending on the user interface, this can become quite complicated. Before such automation, the best counterperson needed good auditory memory and speaking skills, was able to work a cash register and could make change. After this level of automation, the best counterperson no longer needs a good auditory memory or how to make change. But they must master a multi-faceted keyboard with more and more options and combinations.

This enables businesses to offer more options to the customer, to enjoy better inventory control and to be able to utilize a greater pool of candidates who can serve as counterpeople. However, there are some groups of people who can no longer perform adequately in this new environment. This is a case in point of how the basic nature of a position essentially considered non-technical, is changed by technology.

At the personal computer level, let’s take the example of the bookkeeper. For centuries, a bookkeeper recorded numbers manually on paper, entering numbers by hand, re-checking, double-checking, adding, re-counting, reporting -- all done by hand and on paper. In the 20th century, with the introduction of the adding machine, this made some change to the nature of bookkeeping, but the primary process of recording numbers remained unchanged.

The classic skills of a bookkeeper were knowledge of good bookkeeping practices, commitment to following those practices, clear handwriting and satisfaction in entering and organizing each and every number. In the last 5-10 years, bookkeeping for small businesses has been automated. The new skills require the ability to use a computer application, and including the ability to track all electronic entries, archival, recovering, balancing, on-the-spot report generation, import/export from/to external databases in various formats, etc. Most of the information is visual on a computer monitor and good keyboard skills are essential. Given the spread of computers, a person who has been a

successful bookkeeper for 20-30 years may find that their skills are no longer a good match for their profession.

What is subtle about this is that someone who is successful in a profession that remains secure in the digital society, may still find that they need to be re-trained to continue to work at their profession. Or, even with efforts at re-training, they may no longer be suited for that work.

One challenge of the digital society is to frame all work according to both the technical skills required as well as the compatibility of those skills to each candidate worker.

It almost goes without saying that investing in the ability to re-train is essential to the future of the digital society and self-sufficiency of individuals. It can be done in traditional classroom settings, as well as new Web-based learning techniques. And it can be supported by societies through a number of ways such as government subsidy and tax benefits. At its best, education would not be limited to technology and employment skills, but would encompass any kind of education, the idea being that an educated populace works to the benefit of society in both the short and long term.

XII.D. Education

Nothing has changed American education more than the introduction of the personal computer and the Internet. The U.S. government's efforts to bring all schools online has been dramatically successful and plays out in the study results of the National School Boards Foundation. Quoting from their study overview:

"Parents and children alike view the Internet as a positive new force in children's lives. Despite recent negative headlines about online violence, pornography, predators and commercialism, parents and children generally are upbeat and favorable about their own Internet experiences. Parents, in fact, are even more positive than children - they believe the Internet is a powerful tool for learning and communicating within families, and they want their children to be on the Internet. And, as parent responses suggest, the Internet can be an equally powerful tool for schools that want to increase family involvement. The data also suggest that schools have an opportunity to help bridge the digital divide between those who have computers and Internet access and those who don't."

High schools in the United States require Internet literacy and offer numerous classes in Computer Science, while elementary education has primarily incorporated the Internet.

Even more significant in terms of education has been the need to continually educate the workforce given both the introduction of technology in the performance of work, as well as the constantly changing nature of technology. While the video

networking of remote classrooms has been a reality for many years, new forms of Web-based learning are becoming increasingly effective.

One successful new model combines the Web with the involvement of human tutors. A company that utilizes this approach is DigitalThink, Inc., whose methodology can be further examined by visiting their Web site, www.digitalthink.com. Providing courseware of many varieties, they enable the individual to acquire new job skills through the medium of digital technology at a time and in a place that is suitable to the student. Their approach recognizes the role of the human teacher as each student progresses, and with technology, those teachers may be any place, as well.

XII.E. Entertainment

Entertainment is one of the most apparent changes to the digital society, and while it affects people of every age, by far the largest consumers of entertainment is the American teenager. Since all other generations being merely a subset, their use of entertainment technology is used as a benchmark.

First of all, there is the popularity of video games among the Echo Boomers. With video games available on a full range of devices -- from hand-helds to video game units to personal computers -- numerous studies have shown that in homes with these technologies, television viewing (the time-honored choice of teenagers) has actually declined. The personal computer plays a variety of roles here. First of all, the CD-ROM games, as well as similar games which have been downloaded from the Internet, utilize the personal computer. Some of these Internet games are the same as available on CD-ROM, while others enable two or more players to be simultaneously online, playing each other, and have serious Web site tie-ins. Game-playing is definitely high on a teenager's list of activities.

Other popular uses for the personal computer include email, interactive chat sessions, visiting Web sites and downloading popular music. In fact, a recent study performed by the National School Boards Foundation found that Echo Boomers who use the Internet spend more time reading and, like the video game users, less time watching TV. It also found that girls do use the Internet as much as boys, although for different reasons.

Still, the fact that they are watching less TV may be misleading. What television they do watch carries a different weight in their lives. There are many more channels, the facility of remote channel changers and 24-hour programming directed specifically at their tastes. As a result, the prior measure for the impact of television on an individual was the number of hours spent watching. Today, the experience of watching television has changed so dramatically, it's generally agreed that impact will need other measures to be adequately understood.

For example, television viewing is also now linked to Web sites and activities therein, and the recording of programs for later watching is becoming even easier with

the introduction of tapeless VCR's, also called "Personal Video Recorders" or PVR's. The early players in this market were TIVO and ReplayTV, who have subsequently partnered with Sony and Panasonic, respectively. This has led to both increased storage capability and anticipated satellite services, among other technologically-convergent opportunities. For simple mobile TV watching, there are a number of hand-held televisions available.

In the audio realm, the aforementioned downloads of popular music, while extremely difficult to download due to their large mass transport volume, once downloaded, may simply be played on their personal computers, burned onto CD-ROMS, and loaded on to digital audio players, such as the Rio. Declining in popularity is the audio cassette, due to its inferior sound quality. The portable CD player with headset is a mainstay, with portable Minidisc player/recorders making important debuts. Teenagers are motivated to listen to music at all times and in any number of ways -- on their personal computer's CD player at the same time they are using the pc to run other applications, or simply walking down the street. There are a plethora of audio listening and management options available, and they are growing. This is underlined by the fact that 72% of all teenagers who have used the Internet have visited a music Web site.

Going to the movies, that classic occupation of teenager's time, is as popular as ever and is now augmented by DVD technology. DVD players enable viewing of movies on one of the family televisions or on personal computers. For mobile movie viewing there is now AC/DC TV/VCR combination devices from such major manufacturers as Magnavox, Panasonic and Samsung, to be run presumably in the back seat of automobiles.

The teen market on the Internet is growing with the addition of teen shopping malls and the like, all competing for their spending dollar. Nevertheless, it can easily be seen that the ever-expanding entertainment possibilities can be expected to follow the natural evolution of technology convergence.

XII.F. Privacy

Privacy is a significant issue in any digital society, but how problematic it can be depends on the society in question.

XII.F.1. Privacy Policies

Privacy as a right varies with each nation's laws. The European community has generally embraced a privacy policy that effectively protects individual privacy. In its essential form, an individual owns all the information about himself. In the United States, privacy policies covered by law extend only to specific areas, such as credit reporting and medical information. The great bulk of information, such as how an individual uses the World Wide Web, what purchases he or she makes while online, what information he seeks, the address presented for a shipment, etc. is not owned by the individual, but rather

by the corporation or organization which collected the information. This information can be bought, sold, passed around, and exchanged.

The revenues and valuation of a company may depend very heavily on the data that it has in its possession, and this is only further complicated by sophisticated data mining algorithms. The combining of databases and improved techniques can yield surprising information about an individual. Perhaps even worse -- it can yield misinformation about an individual.

The extent of this assault on individual privacy is only just now becoming understood by the American public, and thus far, has been related to specific events, such as the release of email addresses by a major Internet Service Provider. Today, in the United States, what is known about an individual, and who knows it, is unknowable to the individual.

Organizations in general have fought legislation governing this situation since they are fully aware of the value of the information in their possession. Their corporate valuations frequently depend on the assessed value of their data. Take away the ability to legally possess and use that data, and you take away a substantial portion of their assets and value as a company.

In response to the public outcry, major U.S. companies and most Web sites have developed privacy policies vis-à-vis the information which they may collect on their customers and Internet visitors, and they make these policies available digitally. Still, having a privacy policy does not guarantee that the privacy of an individual is protected. It simply states what the organization's policy is. Given the ever-increasing efforts to utilize information digitally in the United States, the rights of the individual and the desires of organizations are destined for conflict.

XII.F.2. Email

Another area that should be mentioned in the privacy area is the use of employee email for private communications. The email of employees within corporations, government or NGO's in the United States are the property of and the legal responsibility of those organizations. There has been significant usage of employee email for private communications, and these communications are not protected under any U.S. privacy law.

The downside for the individual has been the exposure of what was considered private and personal information, and for the organization has been the legal ramifications when such email contained harassing, threatening or otherwise illegal materials. While this situation can easily be remedied by encouraging employees to utilize free Web-based email accounts via their corporate systems, this remains a problem since many individuals continue to use their employer's email for private communications. It is thought that most employees confuse the protections they enjoy in speech while using their organization's telephones with their communications via the

Internet. Due to the nature of the medium of email itself, no similar laws are anticipated in this area in the United States.

XII.F.3. Digital Terrorism

Whether at the international, national, regional, organizational or individual level, there is a societal belief that preventing attacks of Digital Terrorism is essential and protects the common good.

It is usually argued that the technical solution to this requires that "traceability" be built into digital systems, and the obvious result is that the more traceability, the more individuals and organizations must surrender a commensurate loss of privacy.

This statement, on the surface of it, is true. But it speaks to a system architecture that says that the culprit or culprits must carry a name, or set of traceable aliases, so that they may be promptly traced back to their source and ultimately brought to justice. The problem is, while millions, if not billions, of individuals yield up their personal information for traceability purposes, it requires that digital terrorists cooperate as well.

Let's take the example of the recent hacker incident in the United States in February, 2000. A number of major Internet portals, including Amazon, Yahoo, CNN and eBay, were attacked over several days, and each experienced an inability to deliver service for a number of hours. This approach is called a "denial of service" attack, since they denied legitimate users from accessing the Web sites. To do this, a number of sizable network computers with reasonable bandwidth to the Internet and a vulnerable security system were found and the attack software was loaded on. The hacker(s) were able to launch the attack by triggering the software tools previously loaded on to the vulnerable system, and in a sense took over these systems to send millions of simultaneous requests to the target victims, overwhelming the sites by sheer volume.

Now, one could argue that if we just had their rightful name on each of these accesses than we could track them down and find them. At its most compromising, email sent by individuals living under oppressive government regimes would be physically endangered by requiring that they identify themselves. At its most ludicrous, it's a little like asking bank robbers to wear name tags. All of private citizens would be running around wearing name tags and the real robbers would be wearing fake ones, or none at all.

This is similar to the argument presented by the U.S. Department of Justice against permitting encryption of this same data. Of course, there is an historic tradition for such seemingly radical positions by DOJ. Early in the last century they put forth an argument that cars should be outlawed since thieves would be able to get away quicker, and the justice agents could not catch up them. What is socially interesting is that economic forces will loosen the encryption policy, far before the privacy concerns of individuals.

One suggested approach is to require that all computers on the Internet must act as "Good Digital Citizens," or its owners would suffer consequences not unlike being blatantly negligent in the physical world. In this case, the vulnerable systems were computers that had not taken standard security protections.

When viewed from this perspective, there had been serious warnings that just such an attack was anticipated since late December. The attack tools were known to be readily available on the Internet, and there was evidence that they were being loaded onto systems around the world. The Good Digital Citizen would say to himself, "I need to be responsible so as not to unwittingly participate in this terrorism." While all the participating vulnerable systems did so unintentionally, there were no consequences for permitting/enabling this happen. If there were legal consequences for acting as an "Digital Accomplice," albeit an unwitting one, than this particular approach would seriously deter the success of such an attack. In short, the right of participating as part of the network carries with it the responsibility for being a Good Digital Citizen.

Arguments against this include the fact that systems would likely require additional computational capability to deliver the same level of performance. And that they would require additional administration personnel who must track and make this happen. From the author's perspective, this is part of the cost of having safe networks. Would we remove the security measures at our airports because they cost too much, and slow traffic down? Of course, not. In this case, attaching a criminal/civil liability to the owners of a computer system which has not acted in a responsible improves the quality of the Internet enormously.

But make no mistake -- this is not a complete solution. In the face of digital terrorism, security is an ongoing, ever more challenging dynamic. There is no quick fix, no overriding design, no Digital Great Wall of China to prevent attacks. Each new defense raises the bar for the next attack. It is like life. But there can be corrective power in the very architecture of the Internet, and it may be used to proactively work on behalf of security -- countering digital terrorism while still protecting the privacy of individuals, organizations and governments.

What is absolutely clear is that network architecture can evolve with security goals in mind. Then creative and innovative counter-measures can be taken so that the network ultimately protects the network.

XII.F.4. A Right to Information

It bears consideration that the flip side of privacy is the right to exchange and access information without interference. While we may agree on an international basis to restrict certain types of information deemed to be a danger to society at large, it is not clear that it is technically possible to do so, especially with the ready availability of encryption mechanisms. With Web addresses from around the world instantly accessible, and access being essentially free after the basic threshold investment is met, private, uncontrolled and uncontrollable international communications is a reality.

Still, the futility of any national government to declare certain types of information unfit for its citizens does not mean that individuals cannot control what finds their way into their Internet experience. One such schema for qualifying data is under consideration by the World Wide Web Consortium headed by Tim Berners-Lee at the Massachusetts Institute of Technology. This would enable any Web page to have a series of tags from a large number of reviewing entities. (This could be extrapolated to any data unit.) In this way, any browser could effectively look for the previewed tags and limit viewing of pages to only those acceptable to the user. Untagged pages would be presumed to be problematic. This type of scheme both prevents unacceptable information and enables choice on the part of the individual.

XII.G. National/International Intellectual Property Rights

If there is to be a robust global information economy, one issue must be resolved -- the protection of intellectual property. From the United States perspective, it would like to see a strong version of its own patents and copyrights systems implemented worldwide, and for good reason. From the standpoint of the entrepreneur, how smart is it to invest in the development of a software package if whole populations need only buy one copy, and replicate it over and over. Or one chip, and reverse-engineer its design.

Still, all nations must figure out a system whereby entities from one nation feel confident that they can invest in another and realize their profits. This requires a mature look to a total global economic system. The solution may come from nations joining in a "Global Technical Properties Community," with joint economic benefits and alternative economic downsides.

XII.H. A Changing Role for Government

The basic driver for the size and nature of any governmental system has always been control. What you can't control, you can't govern, and that is the basic challenge facing governments with the now widespread availability of the Internet. Despite efforts by various nations to ban the Internet, and others to bar usage as it relates to undesirable political activity, it appears that these efforts will eventually prove fruitless.

XII.H.1. Pan-National Internet Communities

On a global basis, we are witnessing the unprecedented rise of international Internet communities that cross geo-political boundaries. One simple example was observed by the Internet division of the BBC. While news and information about and to Africa has been their smallest broadcast unit in terms of viewership/listenership, BBC Web personnel observed that African information on their Web site consistently ranked in the top ten areas for Web traffic. They found that there was a significant body of African Americans who were interested in this news, as well as others around the globe. Their audience was really worldwide. Add in the interactivity engendered by the Internet,

and it not only empowers this community, but it also influences the quality and scope of the BBC media coverage, in general and toward Africa.

The question then becomes: since these communities are becoming more and more powerful, will they ultimately effect a change in the power of their respective nations? And how nations interrelate? Or international policy? At the very least, it suggests that international organizations may well need to be re-structured. The United Nations, considered simply as an organization, reflects the communications capabilities and political situation of an earlier era. Re-consideration of that structure is clearly in order.

XII.H.2. Structure of Nations

Within nations whose political structure is based on a representative form of government, there are now many more ways to structure government. In the United States, the sessions of Congress were designed to accommodate the time required to return to family farms on horseback and handle attendant work. Today, representatives visit their districts frequently, but still actually must be physically present to vote, although there is really no need for them to do this. Many opportunities for change are possible, although change will no doubt be slow, if not nonexistent, given the nature of politics and power.

XII.H.3. Governmental Services

Among the changes in structure for the national governments themselves, is a serious re-evaluation of the services to the citizen that they provide, and this is in a very confusing state. Take for example, the U.S. Postal Service. For many years, it provided the only logistical way to simply move the great bulk of citizen's mail. But this was in a time when no one other than the government could undertake this effort. Those possibilities have changed.

One question is: should the Postal Service be in the business of overnight delivery, given that there are a selection of competitive private companies to choose from? And now the Postal Service is introducing new services. It is now offering a monthly Web-based bill-paying service. When you consider that there are a selection of Internet start-ups offering the same service, one might wonder why the government is entering this realm. And why any government would enter into a competitive service being handled in a cost-effective way by multiple private enterprises.

Other examples of services which the government provides includes voting. This has long been an area that is a candidate for digitalization. Like many things involving technology, this is not as simple a question as it appears. In March, the first electronic votes were handled in the Arizona Presidential primary. Since people could vote from any personal computer, it is presumed that this makes for a much more convenient way to vote. But there is a potential downside.

The voting booth as we know it is a very private place. You are guaranteed that your ballot is secret, and that you are alone in the voting booth. Can we be assured when you vote from home or from work that you are in a non-coercive environment? Would you be influenced by the fact that your spouse might be looking over your shoulder or be able to tell from your computer how you were planning to vote? While electronic voting carries its own set of technical challenges, the fact that no place free of coercion can be created may, in the end, interfere with the implementation of electronic voting.

On the strictly information side, the single most welcome change engendered by the introduction of the Internet has been the creation of U.S. government Web sites, which deliver a plethora of information to citizens and non-citizens alike. In addition, U.S. citizens can now obtain tax forms over the Internet, and in some cases, actually file their tax returns.

XII.H.4. Technology Supportive Policies

One important aspect of any government today is the role it plays in ensuring its nation's place in the global information economy. The burning question of the moment is whether or not to tax the Internet. While the U.S. has recently voted to keep the Internet tax-free for the foreseeable future, the European economic community is seriously considering just such a move.

Economic policies can result in what is considered to be Internet-enabling business environments or Internet-challenging business environments. Enabling environments invite high-tech businesses, support the development, acquisition and retention of highly skilled technical workers, protect the privacy of the individual, cooperate with the build-up of communications infrastructure, ensure intellectual property rights, and maintain import/export policies favorable to commerce. Internet-challenging environments do the opposite.

XIII. The Single Biggest Challenge: Personal Sovereignty

The confluence of the momentum of a global information economy, the decline of the power of the nation state, and the increased empowerment of the individual makes for a new world order. From that viewpoint, it can be argued that each individual is a sovereign state.

While nation states are not being eliminated, their future may well lie in honoring each citizen's "personal sovereignty". Simply speaking, it is the role of government, then, to focus on, respect, enable and preserve the personal sovereignty of every individual in this new digital society.

The global societal benefit is arguable, but interesting. There was a time in the not too distant past when if a person moved from Europe or Asia to the United States, they would likely lose track of their families of origin. And when they were finally naturalized as U.S. citizens, they were asked to surrender their original passports. Newer policies

permit dual citizenship, and when coupled with improvements in both communications and transportation technologies as well as the freedom to travel, families can now effectively operate on a multi-national basis.

These four components -- the pressure of the global information economy, the transformed nation state, the rise of the individual, and the ability to maintain strong multi-national family ties -- are unprecedented. While the history of man tells us that there will always be armed conflicts, elongated multi-nation wars as we have known them in recent centuries may be eliminated, simply due to the self-interest of a fully-integrated world.

With all this in mind, governments might well consider implementing policies which overtly recognize that every individual has a right to be a member of the world community. It could be argued that the new role of government is actually to extend this capability to each person. The ultimate result would be a future where each of us are global citizens.

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Appendix I. The Laws of Technology Convergence, Version 1.0

Foresight requires vision. In the case of examining and further anticipating the societal consequences of digitalization, just how far ahead can we envision? And what is the relationship between the introduction of a technology and its ultimate impact on society?

Real, and not-so-real, technology breakthroughs are being announced constantly, along with spirited predictions on how they will ultimately perform when they become available to the masses. Just as dizzying, myriad business and consumer products are introduced daily, each of which is presented as newer, faster, better, cheaper. There are no clear answers to the question of what technologies will be introduced to what populations when, or reliable predictions on how they will be accepted.

One standard approach is to consult with both futurists and business publications, whose business it is to provide insight into these matters. What's clear is that the further out on the timeline one goes, the less the futurists agree on when a technology will become available, much less what exactly that technology will look like. Many factors need to be addressed before a society, or portion of a society, will embrace a technology and the rate at which it will adopt it. Then, and only then, will the societal consequences unfold.

With that in mind, an additional methodology is offered to observe how technology evolves, so as to offset and temper the mountains of information being provided from so many sources. These ideas have been formulated into "The Laws of Technology Convergence, Version 1.0," and they are offered as a guideline. Please know that they are entirely open for review, discussion and refinement.

Let us also be mindful that society is much more difficult to understand than technology. And while few of us are futurists, each of us has particular insight into various facets of life. By giving ourselves a sense of how to view technology as it unfolds around us, each of us can contribute significantly to our societal future.

A. Elemental Technologies

One confusing component of technology is determining when technologies are really new. Existing functions and services are constantly and dynamically being combined and re-combined into overlapping and apparent new delivery structures. Products marked as "new" and "improved" may simply be slightly modified products entering an already saturated market.

For our purposes, we will break out useful functions into “elemental technologies” and attempt to dissociate them from their consumer product embodiment. Let’s use the example of email.

Email is not simply available on personal computers in a person’s office or home. Today, a person may also access his or her email through a cell phone, through a laptop, through a network of distributed servers, through the computers of others, through a Personal Digital Assistant (PDA), or by calling an 800 # (a toll-free call within the U.S.) and having it read to them by a human. Additionally, any fax may be converted into an email, and any email into a fax. On demand, or automatically.

So, is it a consumer product? And is it a service? Or rather, a collection of many products and services? And does it matter? Good question. In an attempt to avoid confusion, we have observed that people colloquially refer to these elemental technologies by their first generally-accepted names and original function.

Take, for example, the “cell phone,” a relatively early name for the capability of mobile telephony. Whether digital or analog in nature today, many people continue to refer to this device as a cell phone, even when they are retrieving their email and pages through this same device. They continue to refer to it as a cell phone.

B. Some Proposed Laws of Technology Convergence

There are already several familiar laws that concern themselves with how technology develops, and certainly the most bandied about is Moore’s Law. Formulated by Gordon Moore, a co-founder of Intel in the early 1980’s, the law asserts that the number of transistors on a chip will double every 18 months while the cost of production will halve. This has also been translated to mean that processing power will double every 18 months while the cost will halve. Obviously, this is a law which can only hold for a limited number of years, and then only while the technology of the transistor and the chip are essential to useful products and services. Current predictions sees this law holding only in the near-term. Even Moore himself saw this as temporary.

Still, processing power is only one predictor of the rate of change of technology.

There have been other ancillary laws, including the cost of the capital investment required to fund such technologies, and its upper limit, but again, such laws require that the costs and nature of underlying technologies remain relatively unchanged. There are other laws which relate the value and the costs of communications technologies -- in simple terms, the more people with telephones there are, the more valuable each telephone becomes, while the more telephones that are produced, the cheaper each one is to produce, and presumably to buy.

The laws proposed in this paper are intended to focus, not on particular products and services, but rather on the actual convergence process.

Law: Elemental technologies will always increase in capability, have smaller physical footprints, weigh less, and become cheaper to produce.

This law may seem to simply be a weak derivative of Moore's Law, but it has the advantage that it can remain true over time. History shows us that all technologies follow this trend, even in the face of societal catastrophe. And it is important to remind ourselves of this law whenever we find ourselves saying a technology doesn't do enough, is too bulky or is too expensive. The question is: what will happen in society when that problem is solved? And what other elemental technologies will be fed by it?

Law: Predicting the rate at which elemental technologies will increase in capability, have smaller physical footprints, weigh less, or become cheaper to produce, is not possible over the long term.

On the face of it, this may seem to be a direct challenge to Moore's Law, but the important phrase is "over the long term." From the author's point of view, Moore's Law is an observation of Gordon Moore's based on the Laws of Technology Convergence. Such vision for the near term is exactly what we're looking for.

Law: The business community will always attempt to combine and increase the number of functions from already successful products to create new products.

Corollary: Multiple functions within a single consumer product may erode the value of any individual function.

Corollary: Multiple functions within a single consumer product may increase perceived value to the potential buyer, but is not a predictor of which functions will actually be utilized.

Law: Only functions that are utilized have an impact on society.

Law: Any business proposition that proposes combining previously successful functions into a new consumer product is not necessarily a sound business proposition, or the earmark of a successful consumer product.

These laws and corollaries taken together point out why it so difficult to assess what is going to happen when faced with enthusiastic product announcements.
What is most important is to attempt to determine when this combining process actually yields new functionalities and breakthrough products.

Law: New functionality is the combination of two or more previously

existing functions which together deliver more then the convenient grouping of these functions.

Law: New functionality is the earmark of a breakthrough product.

One example of a future combining of elemental technologies which will clearly present new functionality and breakthrough products with be the marriage of cell phone technology with hand-held GPS. It's one thing to call for help and to be able to communicate where you are. It's quite another to be able to be found without your being involved.

Besides combining functions, there are also ways we can observe individual functions increasing in capability.

Law: For any existing function, one-way communications technologies will always be replaced by two-way communications technologies, as soon as it is technically and economically possible.

For example, the original pager technology was a one-way broadcast medium. A request to page would be received and broadcast out. If the target pager was actually on the belt of a businessman on an airplane, the page could not get through. Nothing registered that the page had not been received. The newer, more feature-laden pagers today have two-way capabilities, so that when the pager finally receives the page it sends back an acknowledgment. In the case of the businessman, whose pager was out of range when he was aboard the airplane, the system is aware that the page was not received, and it will send out again and again until it's received. This two-way capability greatly improves the performance of the pager and of any "function" with an underlying communications capability.

Law: Basic technical resources, i.e., the bandwidth of all communications paths, processing power and storage capabilities, will constantly be increasing.

Corollary: While basic technical resources increase, they will always be outpaced by the resource requirements of new applications.

Corollary: While basic technical resources increase, there may be a sufficient threshold of resources for individual applications.

This is a simple way of warning that at some point, any particular function can work well enough for human consumption (like the telephone), yet there appears never to be enough technical resources to meet the human imagination. While a particular function may be satisfied, the next generation of functions will exceed the currently provided capability.

One example might be video on the Internet. Internet video is truly limited by bandwidth and data storage. Until this resource situation is solved, only limited video data can be delivered. Until then, the actual potential for using video on the Internet cannot be fully realized.

Taken together, this law and its corollaries suggest that once Internet video reaches a sufficiency of bandwidth, than there will be new applications that will require even more.

Law: Multiple functions are combined into new applications when an excess of technical resources becomes available.

But another phenomenon may occur. With an excess of resources, it is cheaper and easier to build technology that begins to take advantage of this excess. Right now, much effort is placed on compressing data, so that more effective information can pass through the limited bandwidth available. Certainly, with increased bandwidth, it's cheaper and easier to dispense with implementing data compression algorithms.

Law: Once a function can be implemented without regard to resource limitations, it is costly to re-engineer it to be more resource-efficient, and due to added cost, the marketplace resists it.

So, in addition to human imagination, the marketplace will also drive the apparent need for increased technical resources.

And then we can view certain human limitations, when anticipating the evolution of technology. Even though consumer products can enjoy widespread use, any product that, in use, involves a human has a very weak partner.

Humans can only read so fast, type so fast, react so fast, etc. When a human is involved in the operation, control or utilization of a device, the human eventually becomes the limiting factor. To this end, some new applications reflecting a breakthrough in technology may not be successful in the marketplace as a previous technology simply because there is no perceivable improvement to the human. One could argue that this has been the case with HDTV.

Law: Any function can reach a threshold level of capability where the human capability to deal with the function is saturated.

But this does not mean that humans don't have preferences until that threshold point is reached.

Law: Successful consumer products diminish in size and weight over time, and ultimately become mobile or embedded.

Corollary: Any function that serves a useful purpose as a stationary

device, will continue to be useful in its mobile state or in an "invisible" state, and may be even more so.

The most frequent mistake made in the long term prediction of technology is assuming that sufficient, if not, unlimited, monetary resources will be applied to its development. The problems, which can arise while attempting to bring technology to another level, may not all be solved by funding. And when some of these problems arise, funding can be diminished, or completely withdrawn. When anticipating the time lime of new technology, it is essential to distinguish between what is technically possible from what is technically likely.

Law: No technology exists in a vacuum. All technologies depend on other technologies, for both operation and/or manufacture.

Law: Projections for the evolution of a technology depend on the evolution and/or dissemination of other underlying technologies.

Law: Technical prototypes frequently only reveal performance and operational architecture problems. They seldom reveal mass manufacturing problems.

Law: Technologies evolve until their improvement no longer benefits other existing technologies.

Corollary: The evolution of a technology will plateau until other technologies evolve or disseminate to a level that re-engages it.

The most effective use of these laws and corollaries is that it reminds you to look closely at the total environment of any technology.

And finally, with respect to the attributes of any proposed technology, the technology breakthroughs of the last 2 decades require that we look at even individual technologies differently.

Law: **Unless a technology is interconnected to everything else, it will have virtually no value in the digital economy.**

Law: **Unless a technology is scalable, it is destined to rapid obsolescence.**

Consider you are being presented with a mousetrap. Unless it's an online mousetrap, it may have limited value.

Proceeding further, you know you can catch a mouse with it, but how about a bear? In the old days, if you had a large computing problem you would have to procure a

mainframe computer and pay for custom application programming. Today, you attempt to solve a big problem by precisely scaling it to a network of distributed servers.

In short, to catch a bear you would want to be able to ask: How many mousetraps do I need to buy?

Again, these are simply a first pass at the a set of laws to describe how technology converges. Input and discussion is encouraged.