2001 Update – Competition Moves Forward

The New Global Telecommunications Industry & Consumers

IIP

BY PENN STATE UNIVERSITY'S INSTITUTE FOR INFORMATION POLICY

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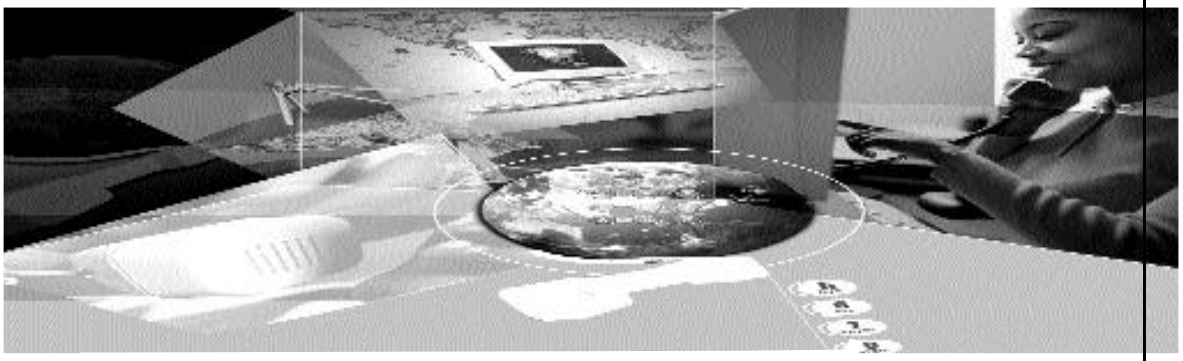


"Change is the law of life.
And those who look only to the past or present
are certain to miss the future."
John F. Kennedy, 1963

The New Global Telecommunications Industry & Consumers

2001 Update – Competition Moves Forward

BY JORGE REINA SCHEMENT

INTRODUCTION

by Jorge Reina Schement

The Information Age dares us in the extreme – how does one observe what can't be seen? There is no balcony from which to observe the Internet; no gate from which to watch the information work force arriving; nor a mountain from whose heights one can survey the information economy. Yet our need is great and the stakes are high. If we are to profit from the fruits of this revolution, we must manage the transition with vision and wisdom.

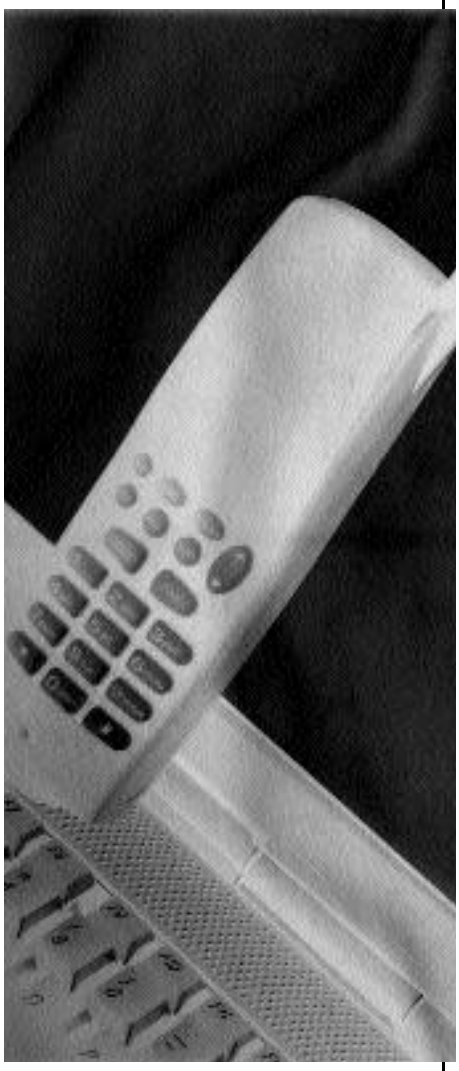
As the telecommunications industry continues its rapid evolution – reshaping itself on a true global scale – confusion and misperceptions seem to walk in lock step with it. The pace of the industry's change, and the speed of the technological and market forces propelling it, may well exceed the ability of many to absorb and comprehend it.

In this volume, we take up the challenge. Leading experts – business and social observers – have come together to sift through the data, analyze the findings, and compare notes. Each contributor examines a key facet of the proliferation of global networks in order to determine how those changes affect and benefit consumers. Moreover, and no less importantly, each essay is written in language free of the usual opaque jargon that industry outsiders often find so indigestible. The result is a comprehensive readable analysis of the dramatic changes driving the telecommunications industry today.

Ultimately, by offering a clear, understandable study of this fast-evolving industry, these essays will contribute to a clearer, better-informed public dialogue. Each essay in this new volume has been updated to include more recent facts and figures. Additionally, before each essay, the author has provided his insights into what he originally wrote – what he got right, what he may have gotten wrong and where he sees the industry going in the future.

The New Global Telecommunications Industry & Consumers

2001 Update – Competition Moves Forward



BY ROBERT GIBSON

Analysis

TECHNOLOGY AND CHANGE by Robert Gibson

Since the first edition of The New Global Telecommunications Industry & Consumers as published in 1999, both the market and technology have continued to evolve. Some of these changes have enhanced the services available to consumers, while others have slowed the acceleration of innovation. I have identified eight significant trends in the market.

The first trend, and one that really excites consumers, is the availability of broadband, high-speed Internet access to the home. The excitement of full-motion, television-like applications on the consumer's computer screen has drawn many Internet users from relatively slow dial-up modems to digital subscriber line (DSL) or cable modems. In the first edition of this report, I estimated that 85% of the U.S. population would he using DSL or cable modems by now, 2001. However, while the interest is there, the difficulties encountered by the telephone and cable companies in deploying these services efficiently has slowed penetration. Additionally, cable and telephone companies are slow to offer these services in rural areas until the major metropolitan areas are more fully implemented.

Another trend is that wireless World Wide Web (WWW) technology has begun to take a hold on the PCS handset market, with the newer, more advanced handsets now able to provide limited WWW access. For example, it is now possible to look up a telephone number on the newer handsets from virtually anywhere. It is also possible to check stock prices, news headlines, or even view short electronic mail messages. However, the small screens, very limited text area, and rudimentary graphics keep Internet-ready handsets a "techie" tool. Soon, more handheld devices that communicate with central databases will begin to appear in the market place and, with the advent of third generation wireless applications scheduled to come online in this year, full broadband Internet access will be available everywhere.

Third, there has been an increased acceptance of the Internet in everyday life. Computers now generally come pre-loaded with software to access the Internet -- some even come with Internet access pre-paid as part of the purchase price. People now put URL's on car license tags, receipts, and even government documents. Drivers license renewals, voter registrations, tax payments, and more can now be made without ever having to stand in line. Public documents that only a few years ago were available only via mail or fax back systems can now be downloaded and read online, which saves both paper and time.

Another development is that fiber-optic cable installations have increased markedly in many urban and suburban areas. To some degree, new fiber providers and the additional bandwidth have brought down the cost of telecommunications at the wholesale level (business-to-business). However, the additional bandwidth has not brought down the cost of telecommunications services for the average consumer. Some competitive local exchange carriers (CLECs) have installed fiber-optic cables in multiple dwelling units (MDUs) to offer competitive telephone, cable TV, and Internet services. They have had limited success, however, because many building owners are reluctant to permit multiple, competing service providers to install fiber and equipment in their buildings. This has slowed competition in getting high-speed telecommunications to consumers. Also, many MDUs have old copper wiring and simply cannot support additional telephone lines or handle DSL service. Building owners are really just now beginning to explore fully what is required to upgrade their buildings so tenants can take advantage of advanced services.

Voice-over-IP (Internet Protocol) (VOIP) is another service that has really taken off recently. A few years ago, many industry analysts expected VOIP to dramatically reduce the cost of long-distance

telephone calls. Early success of using the Internet to carry these calls looked promising when average consumer long-distance rates were 20 to 30 cents per minute. The quality of the calls was intermittent and unreliable, but cheap. However, because of competition and slowing growth of the long-distance market, consumers have seen their long-distance charges from traditional long-distance carriers drop significantly. Today prices have dropped to the point that consumers and businesses would no longer be willing to install new telephone gear simply to "take advantage" of cost savings associated with VOIP.

A sixth trend is that cable TV companies have worked to remake themselves over the last few years, in large part as a response to the challenge presented by satellite TV providers. The existing cable TV networks, composed principally of coaxial copper cables, have reached the end of their service life. The systems are getting old, and companies are reluctant to make new investments in outmoded technology. Instead, the cable TV providers are installing new fiber optic-based cable TV with many more channels and greatly improved quality. At the same time, the pizza box-sized satellite equipment that provide services such as DirecTV and DISH TV have made great inroads to places traditionally served for years by cable TV. These services offer competitive and often superior programming options and competitive prices compared to cable TV services. Also, in 2000, satellite TV providers were finally given permission to offer local programming in addition to their 100s of premium/pay channels. Another improvement is that they have upgraded their systems to provide high-speed Internet access in addition to TV programming. This permits consumers who are not near large urban areas to use high-speed access to the Internet where neither DSL nor cable-based Internet access is possible.

Another technological trend is that new technologies, such as optical switches, now permit fiber-based telecommunications to be routed and switched without conversion from an optical signal to an electronic signal and back again. This development permits even higher speed telecommunications backbones, as conversion becomes difficult at higher speeds. By skipping the conversion by using optical switches, backbones can be made more efficient, taking up less space at lower costs. Ultimately, existing Internet routers will become obsolete and will be replaced with optical routers.

Finally, regulators have slowly been moving towards updating antiquated definitions of local versus long-distance service as well as rethinking other historical industry boundaries. In most areas, traditional local telephone carriers are still prevented from providing true Internet access because they are still constrained by the old telephony LATA ("Local Access and Transport Area") boundaries, which has led to the Internet backbone being dominated by long-distance carriers. Also, Internet service provides (ISPs) continue to consolidate and are being acquired to the point where all but a few of the large ISPs are now owned or controlled by the long-distance telephone companies. Large media companies are also merging with Internet companies, further blurring the distinction between content distribution and content ownership.

As changes in technologies have occurred in the communications industry in broadband access to the Internet, the acceptance of these technologies has become pervasive. Further, as telecommunications services continue to evolve technologically, their impact on modern life will increase exponentially and Internet-based communication will continue to grow in importance. We are now reaching the point where these new technologies will be taken for granted just as much as basic telephone services were in the past.

TECHNOLOGY AND CHANGE by Robert Gibson

Over the last two decades, the world has witnessed a tremendous drop in the cost of computing processor power. Processor power costs less than 1/3,300th of what it did in 1971; computer memory is about 1/4,000,000th the cost. As computing power has disseminated from a few elite communities to virtually everywhere on the planet, it has revolutionized the way we communicate.

Today's telephone system works on many of the same fundamental principles and concepts implemented by the Bell System (American Telephone & Telegraph) close to 100 years ago. It is known as a circuit-switched network. Originally, a phone call between two individuals was connected via an analog signal traveling over a closed circuit, connected by a switchboard operator with a large plug-board and sets of jumper cables. Over the years, that system was updated with the familiar "clackety-clack" of electro-magnetic relay switches. Later still, Bell Labs developed the transistor, which permitted switching of circuits with higher speed, smaller space, and greater reliability.

The development of the transistor was perhaps the most significant of the 20th century as it literally transformed the world we live in. Today, the transmission of data (digital information) is just as important as the transmission of traditional voice service (analog information) – if not more so. And, voice traffic is increasingly being carried in digital format because the quality of the signal does not decrease over long distances. The digitized voice traffic is carried over vast parts of the global phone network, which makes it indistinguishable from traditional data.

Data in digital form is tremendously flexible and dynamic. Digitized data can be:

- Stored and forwarded, like voice mail.
- Broadcast from one individual to millions of others, as on the World Wide Web.
- Tagged with different levels of priority, to take different delivery paths. This is known as Quality of Service or QoS. For instance, video traffic for a business conference call can be labeled as "High Priority" to ensure the highest sound and picture quality possible.
- Tagged with "addresses" that tell the gadgetry where to send the signal and allow the data network to dynamically change itself to accommodate the needs of that data. This is known as routing, the working principle behind how the world's largest data-network, the Internet, works.
- Converted to transmit in different formats. Your email can travel from your desktop computer out your phone line, over a satellite, across a cable-TV network, and finally to its recipient on a cell phone. These transmission technologies can be mixed and matched so the consumer can have the most efficient and cost-effective transmission medium wherever it is needed.
- Indexed, categorized, and searched. No doubt, this is an area where computer science and technology will make tremendous progress. Today's popular search engines like Yahoo and Altavista may be reminiscent of Thomas Edison's early black-and-white cinema-scope movies.
- Manipulated. Languages can be translated. Pictures can be compressed or expanded. Sound can be made clearer.

In the future, virtually all information – be it voice, video or text – will be in digital form. But how will that data get to us? How will that be different than how we communicate today? And most importantly, how will those changes to the infrastructure affect us?

THE REVOLUTIONARY INTERNET: THE BASICS

The best model we have currently on how data will travel in the future is based on our experience with the Internet. The Internet has already revolutionized much about how we live and communicate, and it will be the natural forefather of future network designs.

On the Internet, digital data is divided into distinct units of information called packets. Each packet has address information contained within it which carries identifying information, such as source location and destination location, as well as a variety of other tags. These packets are then dropped on the network, where

they travel along the various nodes of the network, called routers. Routers are specialized, high-speed computers optimized to direct the flow of packets. Routers look at each individual packet, compare it to a table that represents the architecture of the entire data network, and pass it on to its correct destination. The ability to make individual routing decisions based on changes in the entire data network, be it temporary congestion in a certain area or a broken data cable, lets routers dynamically adjust or "self heal" to changes in, or damage to the network.

Routers work somewhat like the neighborhood switchboard operators of yesterday. The key difference is when a switchboard operator connected two people on a phone line, that phone circuit could only be used for those two people. It did not matter if people were talking or not: as long as they were on the line, no one else could use that phone line. This is referred to as a connection-based or circuit-switched system, and the traditional phone system since the days of AT&T is based on this concept.

In contrast, the Internet is a connectionless or packet-switched system. Individual packets travel along individual paths. Sometimes all the packets that comprise an email message will take a single path to their destination; sometimes they will take multiple paths. Sometimes the packets will arrive in the right order; sometimes they will need to be re-assembled into the correct sequence. Most importantly, any number of end users or devices can send packets of information along the same path at virtually the same time.

One benefit of this type of system is the lack of the traditional "busy" signal. Video packets, sound packets, email packets, or any type of packet can travel simultaneously to the same destination. The only limitation is the processor power and available information-flow capacity to carry the data.

THE EVOLUTION FROM CIRCUIT-SWITCHED TO PACKET-SWITCHED NETWORKS

The traditional circuit-switched telephone network prior to the 1960s was composed of local, copper "twisted-pair" wires and long-haul, microwave analog "toll circuits." Both the twisted-pair and microwave circuits had severe limitations in terms of information-flow capacity, more commonly referred to as bandwidth. The use of these circuits did not permit the flow of information that is commonly found in the Internet of today. Furthermore, the high cost of the microwave circuits as well as copper long-distance circuits made long-distance service prohibitively expensive for many applications.

Telephone companies aggregate phone calls from business and neighborhoods in central offices (COs). Within these COs, telephone companies use sophisticated switches to connect a phone line to the caller's desired destination. There were various generations of these circuit switches. The first generation switches were manually operated, with operators physically connecting the circuits between the caller and the receiver. The second generation used electro-mechanical relays. Magnets would open and close the circuits using a series of yes/no options "hard-coded" directly into the physical design of the switches. The third generation of switches used the abilities of computers to "soft-code" the decision-making process in the software of the computer. These early switches were introduced into public phone networks in the 1970s and were known as stored program control switches because the switching logic was stored in the software of the computer.

The current generation of voice switches are fully digital and use some packet-switching technologies found on fully data networks like the Internet. However, the switches use digital information packets only to relay information about the phone calls. This digital information tells the switch how to set up and tear down the voice connection and enables additional features like Caller-ID. But the actual data or voice transmission itself still travels along a circuit-switched network. The traditional analog network has been gradually evolving into a system more like the Internet for many years. The recent explosive growth of the Internet has only accelerated this evolution.

Circuit switching was designed for voice communications and deals with information in analog form. Circuit switches are being re-engineered to meet

the needs of data and video, but they are still best designed for voice communications. Packet switching, as used on the Internet, was designed to handle any type of data communications, but transmitting voice packets in real-time puts unique demands on the communications infrastructure. Today, the quality of voice calls on the Internet is not very good, but the telecommunications industry is rapidly developing the necessary technology to optimize carrying voice traffic through packet-switched networks. Within a few years, calls over the Internet and calls over the traditional phone network will be indistinguishable.

Over the years, the technology of voice switches has evolved to make them increasingly packet based, like the Internet. The goal is to allow all types of information to pass through an Intelligent Network (IN) without special circuits or long installation cycles. Data communications and voice networking have been merged to provide a variety of services. Ultimately, planners envision one network capable of transferring all kinds of information regardless of the bandwidth (See Figure 1).

FIGURE 1. CIRCUIT SWITCHED VS. PACKET-SWITCHED NETWORKS

TELEPHONE NETWORK	DATA NETWORK
Fiber & Copper	Fiber & Copper
Circuit-Switched	Packet-Switched
Dedicated During your phone call, your circuit or phone-line can only be used by you.	Shared Your connection to the other party is also providing connectivity to others simultaneously.
Sustained The entire capacity of the circuit or phone line is being used while you are on the line, whether you are talking or not.	Intermittent Your data bursts across the circuit as it is sent, but nothing is sent during pauses.
Analog,becoming more Digital	Digital
Voice	Data,adding voice capability

FIBER OPTICS

Beginning in the 1960s, technologies to make light-wave communication practical using specialized cables became a reality. Unlike microwaves, fiber channels can carry many, many times the information of conventional microwave circuits – and at a fraction of the cost. The reason for this is that the "bandwidth" of the light channel signal is vastly larger than an equivalent microwave channel. This is why many people loosely refer to the amount of information flow in a circuit as bandwidth capability – and available bandwidth governs the number of bits of information that can flow in a given circuit.

Today's demanding communications needs require much greater data communications capacity, or bandwidth. Bandwidth is what lets you pull up a Web page instantaneously, or lets you complete a call to New York City at the same time as a million other people. As computer processor power continues to grow rapidly, as software becomes more sophisticated and as people adjust to using computer networking more and more in their daily lives, there will continue to be an exponential increase in the demand for bandwidth. Fortunately, fiber-optic technology has the ability to meet that demand.

Copper wire is what the phone company has used to provide your phone service for over 100 years. It is non-corrosive, readily available, inexpensive, and an excellent conductor. Through advances in technology, engineers have been able to use the bandwidth that copper provides to carry multiple phone calls simultaneously, known as channels. Two pairs of traditional copper wires can provide up to 24 channels, or 24 simultaneous voice calls. This type of facility is common for large companies. When a company needs the capacity to carry more than 24 telephone calls simultaneously, they need another pair of copper wires.

Obviously, this technology has been utilized relatively well to meet the needs of businesses and consumers over the years. But, using that much copper to link cities, countries, and even continents together becomes overwhelming. Fiber optic cables use beams of light instead of the electro-magnetic signals used on copper.

The amazing characteristic of fiber-optic cable is its ability to carry in excess of 100,000 telephone calls simultaneously by using distinct colors of the spectrum. The signals travel in digital format, free from electrical interference and electrical degradation, and at the speed of light.

INFINITE POSSIBILITIES

Telecommunications has become a mix of transmission mediums. Today the consumer can readily use traditional voice telephony, wireless cellular, wireless spread-spectrum, traditional satellite, low earth orbit satellite, cable, or digital subscriber line (DSL) services to make their voice call or data connection. People have gotten used to the idea of being able to talk on mobile phones. But, mobile connections for video and data are not yet widely available, although in the very near future they should be commonplace. All sorts of specialized applications will be developed to take advantage of this new capability, but they all will rely on common networking protocols used by the Internet so they can be assured of having universal acceptance.

One specialized data communications device used today in luxury automobiles is the global positioning system (GPS). Employing information relayed from satellites, GPS can provide a precise location on the earth that is accurate to within a few yards. Now imagine this same system connected to a limitless data network like the Internet. Remote software agents could seek out the location of the nearest rest stop or pull up a review of that restaurant you are passing. The ability to grab data and convert it for whatever application a user or content provider has in mind provides limitless possibilities.

THE LAST MILE

The laying of fiber-optic cable around the world is tremendously expensive. The only reason companies have found it economical to make the investment is due to the tremendous boost in capacity that can be provided in service for millions of consumers worldwide.
Installing fiber-optic cables to the household does not offer the necessary economies of scale to justify such a costly investment. Furthermore, the necessary fiber-optic equipment needed in the home would be prohibitively expensive to implement on a large scale. So, hundreds of companies have developed other technologies to get more bandwidth into the home without these limitations.

One of the most exciting innovations uses the existing copper phone lines that are already in everyone's homes. This is known as digital subscriber line (DSL) and sometimes xDSL – the x signifying the different speeds of DSL. DSL places a digital signal on a copper phone line, using frequencies not normally used during voice telephone calls. This gives consumers the ability to use their telephone independently from, and simultaneously as their data connection. Since it doesn't interfere with the normal operation of the telephone for voice calls, a user can access his or her data connection all the time, which is often referred to as "always on." No more waiting to dial, connect, and log on. The only limitation of DSL technology is the distance of the copper loop running between a home and the central office of the telephone company. Even with this limitation, analysts estimate that up to 85 percent of the population in the United States will have DSL technology available to them in the next few years. In addition, DSL technology utilizes the existing twisted-pair wire infrastructure that covers virtually the entire United States, which avoids a costly up-front capital investment.

Another possibility for high bandwidth Internet access involves using another existing wire in many U.S. homes – the coaxial cable infrastructure provided by the cable TV company, which has the capability of transmitting data at very high speeds. Traditionally, these networks were designed to be unidirectional, broadcasting data from the television studio and satellite earth stations to homes. However, cable companies have spent billions of dollars over the last several years to upgrade their networks to accommodate bi-directional data transmission to allow data to be sent from the home as well.

The satellite industry has also come up with its own way of tackling the "last-mile" issue. Consumers can now use small satellite dishes (the same 18" receivers used for satellite television) to receive high-speed Internet service. The technology uses an innovative, asymmetrical (one-way) combination of telephone and satellite communications to provide yet another method

of getting affordable, high-speed Internet access. A consumer connects to his or her Internet provider via a conventional modem. Commands from the keyboard or mouse are sent out through that modem connection. The responses to those commands, usually in the form of World Wide Web pages, arrive via satellite over a very high-speed connection. The asymmetrical nature of this communication is adequate for most users -- they don't need much bandwidth from the PC to the Internet, but do require faster speeds coming from the Internet to the PC.

Wireless technology provides yet another alternative. Companies like Winstar use a variety of wireless technologies to provide high speed data communications to the home and to the office. This technology is sometimes referred to as wireless local loop (WLL). Some systems use analog or digital cellular technology, while others use fully digital systems. Today, this industry is in its growing out of its infancy, as wireless networks are being built out in cities throughout the United States. In the very near future, WLL will be a very enticing option for many consumers and businesses.

THE ACCELERATING CYCLE OF INNOVATION

As telecommunications evolved, breakthroughs in technology traditionally took decades until they were fully implemented within the telecommunications infrastructure. Each evolution in technology required a complete redesign of the existing system and the very slow process of manually replacing the components throughout the vast network. Armies of technicians endured years of the monotonous task of replacing old technology with the new.

But at its heart, today's communication infrastructure is powered by flexible computer power. Although computer hardware still becomes outdated and needs to be updated periodically, more technology innovations now come in the form of software upgrades. New algorithms (mathematical formulas) to speed data processing are developed, and entire new classes of service are now implemented through software.

In consumer technology, one common example of this evolution is the software-upgradeable modem. Consumers are attracted to this feature because it extends the life of their modem and the upgrade can be done easily and quickly. Imagine these benefits multiplied by tens of thousands of components across a vast telecommunications network. A network upgrade that in the past would have required millions of man-hours over several years can now be done in just a few days. Telephone companies are now able to develop new customer services, and deploy them on their network for customer use, faster than ever before, and this trend will only continue to accelerate.

The time it takes for consumers to be introduced and gain access to new software and innovations has also been greatly reduced. Consumers can download and try out new software by merely clicking a mouse button and waiting a few minutes for the newest version of software to arrive. The old days of mailing diskettes in the mail will hopefully soon be completely over. Software designers can put a new software package "out on the Net," allowing people to test it and make sure it works without leaving home. Even the U.S. Post Office, not often thought of as an innovator, now permits users to download postage via the Internet, saving thousands of hours of printing and purchasing physical postage stamps.

THE END OF DISTANCE

The advances in bandwidth, combined with the innovations in networking technology, make geographical limitations less and less relevant. These days, it is almost as easy to access the information residing inside the computer on your desktop as on the computer down the street, across the city, or on the other side of the world. Fiber optics provides the capacity; the Internet provides the economical fabric.

The Internet is often described as a worldwide network of networks. By everyone connecting their networks together, individuals gain access to others' communications and data resources around the globe, while giving others access to theirs. Data crosses freely across government jurisdictions, political boundaries, continental frontiers, and cultural barriers. Traditional regulations and definitions do not fit.

It used to be that communicating over long distances

cost more, provided lower quality, and required less bandwidth. Today, widespread use of fiber optics and the Internet makes the technological limits of only a few years ago seem like anachronisms of the distant past. With telecommuting and distance learning becoming a reality, consumers, businesses, and schools can now access a rich spectrum of information, and each other, in a way impossible ten or twenty years ago. Increasingly, people in rural areas who might only see cultural, historic, or scientific events in magazines now can have equal access regardless of where they are.

The development of the Internet over the last few decades is an interesting phenomenon relating to regulation and the service of rural areas. Although the development of the Internet was originally funded via the U.S. government, the last administrative control of the Internet by the government ended in 1995 and the infrastructure of the Internet has evolved completely free of traditional telecommunications regulations. In our nation's history, no other significant telecommunications industry has developed in this type of regulation-free environment. Although this has had many benefits, including the ability to keep up the Internet's amazing exponential growth in demand, it has also led to some not so desirable outcomes.

The principal negative consequence of the market-driven growth of the Internet has been the uneven distribution of Internet infrastructure (e.g., the circuits, routers, and computers) throughout the United States. Today, the top seven metropolitan areas host 62 percent of the nation's Internet backbone capacity, and the top 21 metropolitan areas contain an amazing 87.5 percent of the nation's backbone capacity. The pattern is even more concentrated when considering backbone capacity between the United States and the rest of the world. Over 77 percent of the United States'backbone capacity connecting it to the rest of the world is divided among just three cities: Washington, San Francisco, and New York. These statistics illustrate how rural areas do not have the ability to host major Internet destination sites because those types of sites require tremendous amounts of bandwidth that simply does not exist in rural areas.

Given that the Internet has become a tremendous economic growth vehicle for not just the high-tech industry but the entire country, these statistics start to affect the distribution of the growth of the nation's economy. Fledgling companies like Yahoo! and Amazon.com have recently grown to be $20-$30 billion companies. But these companies, and the others that follow them, will not develop in rural areas where the Internet backbone infrastructure is not sufficient to handle their needs.

REVISITING REGULATION

The regulations meant to spur competition in the 1980s as part of the court-ordered breakup of AT&T introduced such artificial concepts as the "local calling area" (more formally known as the "Local Access and Transport Area" or LATA) and the "long distance" call (also known as a "toll call"). But, with the Internet now connecting vast distances, there is no longer a useful meaning to the amorphous concepts of "local" and "long distance." Now, these dividing lines only serve to allow interexchange carriers to offer long distance and/or Internet services without competition from local carriers.

A new regulatory approach needs to be established that is less focused on the underlying infrastructure and more focused on ensuring a quality of service and equal access to the consumer. To illustrate this point, dialing a telephone is an activity taken for granted today that may disappear tomorrow, and consumers may have the ability to select a particular quality of service/price for each call they make. For example, a consumer may want to download a large IRS pamphlet from the IRS web site and be willing to wait either only a few minutes or up to a few hours for it. The price paid will depend on the service quality selected. Simultaneously, that same consumer might want to make an urgent call on another matter and be willing to pay a higher price to have that high-speed and high-quality conversation. It may very well be that each "call" over the phone network or Internet will be selected upon required cost and/or speed.

Telecommunications regulations since the break-up of AT&T have rested upon the foundation of the traditional, voice-switched phone network. Even the revisions of the Telecommunications Act of 1996 failed

to directly address the dynamic nature and the limitless possibilities of a packet-switched data network like the Internet. Current regulations are mired in antiquated definitions of local service versus long-distance service and traditional voice traffic versus "enhanced" data services. Data traveling along a packet-switched network does not encounter arbitrary local/long distance borders, though. And data on a packet-switched network defies traditional, regimented, and static classifications such as voice, fax, text, or video. Whole industries such as television, radio, and newsprint are losing their distinctiveness as the Internet becomes a multi-purpose delivery medium. Today's consumer can listen to music, watch a news video, or read a sports box score in real time. It's not a coincidence that today's leading companies are quickly adapting themselves to provide all these traditional, distinct services on the Internet. Corporations are reacting to the simple fact that today's digital technology is essentially "media blind."

The growth of the Internet as a ubiquitous communication medium is also forcing businesses and consumers to adapt in other ways. Traditionally, public utilities industries have been highly regulated because of their perceived nature as natural monopolies. But now, the rapid pace of innovation and the dynamic nature of the Internet have blurred the conventional barriers between regulated and non-regulated industries. Companies in highly-regulated industries are now fighting in the marketplace to remain relevant to the consumers of tomorrow, while some non-regulated companies are providing public utility services that were inconceivable even just a few years ago. Consumers want and need access to the wide array of services engendered through these new technologies. The key challenge faced by traditional providers of telecommunications services is to offer these services in a cost-effective manner while still providing viable competition.

WHY IS THIS IMPORTANT TO CONSUMERS?

The new digital communications technology is of transcendent significance. In terms of consumer acceptance and growth, the centerpiece of this technology – the Internet – has been the fastest growing technology of this century. People are hooking up to the Internet faster than they originally bought microwaves or VCRs, televisions or radios. Within a few short years, literally dozens of companies have transformed from an entrepreneur's idea to multi-billion-dollar companies. As all digital communications technology evolves, it will affect not just how we communicate, but with whom we communicate. If you have easy access to information, for example, the retailer on the other side of the globe can be just as appealing as the one down the street.

Because this is such a revolutionary, nearly all-encompassing technology, with exponential growth and yet still in its infancy, the regulations adopted to govern it will influence not just all communications networks, but also much of the economy and society at large. Consumers, in short, have very much at stake.

ABOUT THE AUTHOR

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The New Global Telecommunications Industry & Consumers

2001 Update – Competition Moves Forward

BY MARK JAMISON

BUSINESS IMPERATIVES by Mark Jamison

I first wrote Business Imperatives 1999 with an eye towards a world in which communications businesses and customers leveraged the abilities of networks, software, content, and devices to create new products that would have global reach while maintaining local value.Over the past two years, our progress towards this future has been slow because the traditional telecommunications networks have been slow to globalize. As a result, this future is leaving these networks behind and is emerging instead on wireless networks or is arriving solely on the Internet, which leaves little room for networks to differentiate themselves and add value.

In Business Imperatives 1999, I focused on the substantial restructuring that would be needed if the telecommunications industry is to move from its antiquated structure to a structure that fits the customer needs and business economics of the future. I saw two problems. The first problem was that regulation was holding to the local/long-distance paradigm. Companies without long-distance restrictions were building international networks and connecting some customers directly to these networks. Networking was becoming an end-to-end business because this made planning more efficient and added value for customers.But while this was the business reality, the regulatory reality was quite different. Regulation saw either local exchange or long-distance service and never saw the two as one.As a result, the Bell Operating Companies were restricted to customer access networks and, as a result, pursued mergers that created large customer bases for their belated entry into global networking.

Meanwhile, the long distance companies were forced to struggle through drawn-out regulatory and negotiation processes (that are still unresolved) for the right to develop the local components of their international networks.Think how different the world would be if former Federal Communications Commission Chairman Reed Hundt had not stopped a potential SBC-AT&T merger by calling it "unthinkable." That merger would have erased all pretenses that local and long-distance services were somehow inherently different.By now, most of the former long distance companies would have merged or partnered with local exchange companies and the resulting local-to-global-to-local networking companies would have been competing vigorously in expanding local footprints in the United States and internationally.

The second problem I noted in 1999 was that telecommunications was no longer a distinct product, but regulation treated it that way. The future belonged to companies that would combine network features with software innovations, interesting and useful content, and easy-to-use devices.Service bundling and the Internet were just the beginning. With networks becoming global, computing costs falling, and the opportunities for software and content innovations being effectively endless, packagers would emerge that would create valuable new products that leveraged networks, computing, content, and devices. Products would begin in specific cities or regions, but economies of scale and positive network effects would drive them globally. But, although the business future was about putting things together and changing them, regulation worked to keep things apart by treating voice, Internet, and wireless services differently.

Much has happened since I wrote Business Imperatives 1999.SBC and Verizon have completed their respective mergers. The Global One alliance has broken up.The two packagers I referenced, AOL and Time Warner have merged. Sprint and WorldCom tried to merge, but regulators, caught in their local/long-distance paradigm, halted it. The long distance companies, frustrated in their attempts to build local footprints from scratch, began walking away from traditional long

distance, which is dependent on local networks. The government decided to partition the software world by breaking up Microsoft. Vodafone became the global wireless network provider, doing something that none of the wireline telecom players have been allowed to do, create a truly local-to-global-to-local network with an opportunity to develop and market global combination products.

Looking through the lens of the past two years, I continue to believe that my view of globalization of telecommunications and of combination products is correct. However, the resilience of the antiquated business structure has surprised me. I wanted to see mergers of local and long distance companies. These mergers would have sped the development of truly global end-to-end networks, sped the creation of combination products that leverage the abilities of networks, and prompted more traditional telephone companies to abandon the voice world. The lack of global networks has relegated most product innovation to the world of dot coms on the Internet, which has its own problems.

I have also been surprised that wireless has emerged as the most likely global network. Vodafone has globalized wireless, particularly outside the US and with the uniform European technology standards. This globalization, in combination with the exponential growth of wireless telephony outside the US, means that global combination products that leverage the abilities of networks may be based on wireless technologies rather than wire or fiber optic technologies.

Lastly, I have been (only a little) surprised by the lack of deregulation. I believed that the need for industry restructuring and globalization was obvious. I thought that regulators might be inclined to allow companies to merge and divest according to the new business economics, and then to regulate only when monopoly power emerged and endured. Instead, regulation has tried to control the transition, even to the point of preventing it from happening.

This 'telephone' has too many shortcomings to be seriously considered as a means of communication.The device is inherently of no value to us."
- Western Union internal memo, 1876

What happens when yesterday blocks our view of tomorrow? Western Union knows. Faced with changes in technology, customers, and markets, the monopoly Western Union decided to stay the same. Then Western Union faded away, as an upstart AT&T become the new leader in telecommunications.

Western Union is not alone in missing fundamental changes. An IBM engineer asked, "But what... is it good for?" when confronted with the microchip in 1968. Then IBM lost its commanding lead in the computer industry. In 1977, the founder of Digital Equipment Corporation said, "There is no reason anyone would want a computer in their home," then he watched from the sidelines as other companies made off with the home market. The Federal Communications Commission (FCC) and industry interests struggled for nearly 15 years over licensing cellular telephones and cost U.S. customers $108 billion in lost opportunities.

Yesterday continues to block our view when it comes to changing telecommunications businesses. Technologies, customers and markets are completely different today than when telephone companies set up business nearly 100 years ago. But until now, the companies have been unable to change. Unfortunately, a company that was exactly right for yesteryear's monopoly voice telephone service is exactly wrong for the new telecommunications industry. Telephone companies must let go of yesterday and remake themselves for the new environment. Likewise, as policymakers review telephone companies' efforts to change through mergers, alliances, divestitures, and the like, policymakers need to make sure that the telecommunications paradigms conceived yesterday do not impede healthy competitive forces developing today.

A NEW GLOBAL COMBINATION INDUSTRY

The new telecommunications industry is a global combination industry, which means that it has completely different products, markets and customers than the industry we knew just a few years ago. A combination industry is an industry whose product combines with other industries' products before customers use it. Telecommunications is becoming a combination industry because of the convergence of formerly separate, distinct businesses. The industry's primary function – transporting electronic communications – is increasingly combining with computer, media and publishing products before being sold to customers. There are several examples of telecommunications combinations. EDS offers communications networking with its data center management and re-engineering services. AOL Time Warner provides networking, news, online shopping and entertainment. The Japanese telecommunications giant, Nippon Telegraph and Telephone (NTT), provides multimedia services as part of its global telecommunications business. The United Kingdom (UK) telecommunications company, British Telecom (BT), has developed a business incubator Brightstar that allows entrepreneurs to develop combination products.

Convergence is also turning the other information industries – computer, media and publishing – into combination industries. The computer industry's traditional role was information processing, but now it is commonplace for computer companies to provide networking and content. For example, Microsoft Network provides online content. With NBC, Microsoft operates the cable news channel MSNBC. The media and publishing industries' traditional roles were to provide entertainment and other content, but now many of their companies provide networking and processing. For example, local broadcast stations sell space on their airwaves to businesses for data transmission. Before merging with America Online (AOL), Time Warner was the world's largest entertainment and media company, owning Time Inc. (the largest U.S. magazine publisher), several networks, Time Warner Cable (the largest U.S. cable television system), and Time Warner Telecom (a telecommunications company). Newspapers, such as the New York Times in the U.S. and the Financial Times in the UK, provide Internet-based databases.

The combination products from telecommunications, computing, media and publishing companies (for convenience, I simply call these information

FIGURE 1. CONSUMER EXPENDITURES FOR TELECOMMUNICATIONS, COMPUTER, MEDIA, AND PUBLISHING SERVICES, 1996

Information Service Expenditures=$1627	CUSTOMER DEVICES	NETWORK	NETWORK DEVICES	CONTENT
Electronic Devices $338	✓			
Local Telephone Service $234		✓		
Long Distance and Other Telephone Services $504		✓		
Cellular Service $89		✓		
Basic Cable $70.15		✓		
Home PC Software $4				✓
Videocassettes $77				✓
Tapes,CDs, Records $57				✓
Pay Cable $21		✓		✓
Books,Magazines, Newspapers $170				✓
On-line Services $20		✓	✓	✓
Theaters $27				✓
Home Video Games $15				✓

Sources: Statistical Abstract of the United States, 1998; Federal Communications Commission, Trends in Telephone Service, July 1998; and Collis, Bane and Bradley, 1997.

Note: Local Telephone Service and Long Distance and Other Telephone Expenditures are for 1995.

companies) mix and match four basic components: customer devices, networks, network devices and content. Customer devices are what the customers touch and feel. Examples include telephones, PCs, televisions and stereos. Networks carry information from one place to another. Network devices provide two functions. First, they process information for customers. For example, a customer that reserves a rental car over the Internet uses a distant computer to process their request and reserve the car. Second, they store information. For example, a network device might store voice mail or email messages. Content is the electronic information and software that the customer uses. Examples include music, video clips, shared electronic games, and electronic Yellow Pages.

Being a combination industry changes telecommunications' products by redefining the products and services that customers buy. Figures 1 and 2 illustrate this point. Figure 1 shows 1996 U.S. consumer expenditures for most telecommunications, computer, media and publishing services. It also shows the primary components used to provide the service. Each row represents a product or service. The first column lists the products and services and their respective per consumer annual expenditures. The last three columns indicate which components are the primary parts of each product and service. Content and

network are the most important components, making up almost 80 percent of the consumers' total expenditures for the products and services listed.

Figure 2 illustrates the trend towards combination products and services. The rows in Figure 2 represent products. The columns headed "Telecommunications," "Media," and "Computer" show the components that each industry provides for the products. The first three rows are traditional products and services. A single industry provides each. The bottom three rows are new combinations. The first new product, the Personal Digital Assistant or PDA, is a now well-established product that combines personal organizers, cellular telephone, paging, fax, email and computing. The second product, Internet search service, provides Internet links to news, business information, directories, etc. One of the most popular services, Yahoo! has more than 54 million visitors each month and 5,200 advertisers and provides email, chat rooms, news, shopping, auctions, travel reservations, and finance tools. The last product listed, online shopping, allows customers to search for and purchase products from their computers.

NEW COMBINATIONS, RIVALRIES AND RELATIONSHIPS

Figures 1 and 2 illustrate three challenges for information companies. The first challenge is for the companies to grow their industries by combining components in new and innovative ways that create new products. Telecommunications companies are taking initial steps in this by bundling services. Bundling services changes products incrementally and is a first step in creating new combination products. For example, Commonwealth Telephone Enterprises, Inc.,

FIGURE 2. OLD VERSUS NEW TELECOMMUNICATIONS, MEDIA, AND COMPUTER PRODUCTS

	EXAMPLE PRODUCTS	COMPONENTS	TELECOMMUNICATIONS	MEDIA	COMPUTERS
TRADITIONAL	TRADITIONAL TELEPHONE SERVICE	Customer devices Transmission Network Devices Content	Telephones Telephone lines, switches None Customer conversations		
TRADITIONAL	MOVIES	Customer devices Transmission Network Devices Content		Televisions Satellites, cables Cable headends Films	
TRADITIONAL	DATA PROCESSING	Customer devices Transmission Network Devices Content			PCs, computer terminals Local computer networks PCs, main frames Software packages
COMBINATION	PERSONAL DIGITAL ASSISTANTS	Customer devices Transmission Network Devices Content	Wireless networks		Software, microchips Portals Databases
COMBINATION	INTERNET SEARCH SERVICES	Customer devices Transmission Network Devices Content	Data networks Internet host computers Software	Internet host computers News, databases	PCs, digital cameras Internet host computers Software
COMBINATION	ONLINE SHOPPING	Customer devices Transmission Network Devices Content	Data networks		PCs Host computers Transaction software

in Pennsylvania bundles long distance, local service, Internet access, and calling features. Bundling local and long distance will be a key step in the so-called death of distance. Today, distance means nothing for Internet communications and has nearly lost its meaning in mobile communications. Soon, distance will mean nothing for telecommunications over wires and fiber optics. Companies will ignore local exchange boundaries, state boundaries, and national boundaries because the costs are converging, and customers ceased caring about the boundaries long ago.

In addition to the death of distance, there is also occurring a death of means. Companies are combining formerly separate means of communications. For example, Sprint offers Hosting Fundamentals™, which provides complete web site hosting, email, and long distance communications.

The second challenge for the information companies is to face the new rivalry. Because products are combinations, rivalry in one industry or in one area spills over into another because competitors leverage positive feedback, the situation in which product value grows as the number of users grows. For example, Internet backbone providers enter multiple geographic markets because the additional reach increases the value of their backbone networks.

The third challenge is to develop new relationships, especially with packagers. A packager, sometimes called an aggregator, is any company that combines components to provide the new combination services. Computer, telecommunications, media and publishing companies can all play packaging roles, but some companies are in better positions than others to be packagers. For example, many publishing companies have little direct contact with customers, placing them in a poor position to become viable packagers. The same is true for telecommunications companies with small networks. In contrast, telecommunications companies that have grown through mergers and network expansion have both a large customer base and a long history of direct customer contact, which can help them become competitive packagers. Also, new companies are forming whose primary business is packaging. AOL was such a company before combining with Time Warner.

Figure 3 illustrates the growing importance of packagers. This figure lists typical players by industry segment, their most recent annual revenues, and their most recent annual revenue growth rate. The recent

Figure 3. Typical Players for Industry Segments, Most Recent Revenues and Revenue Growth

Segment	Company	1999/2000 Revenues (US dollars)	Annual Revenue Growth Rate
Content	Disney	$25,402,000,000	5.0%
	McGraw-Hill	$3,992,000,000	6.2%
	Washington Post	$2,251,600,000	7.0%
Network	NTT	$97,956,000,000	15.7%
	AT&T	$62,391,000,000	9.8%
	SBC	$49,489,000,000	8.8%
	Deutsche Telekom	$35,796,000,000	-2.4%
	Verizon	$33,174,000,000	4.7%
	France Telecom	$27,242,000,000	2.3%
	Telecom Italia	$25,989,000,000	3.6%
	BellSouth	$25,200,000,000	4.3%
	Qwest	$16,422,600,000	16.7%
	Vodafone	$7,873,000,000	115.9%
Packaging	AOL Time Warner	$33,051,000,000	NA
	StarMedia Network	$20,089,000	375.1%
Processing	IBM	$87,548,000,000	5.4%
	Microsoft	$22,956,000,000	20.4%
	Oracle	$10,130,128,000	17.5%
	Novell	$1,272,820,000	11.7%
Devices	Sony	$63,082,000,000	10.5%
	Philips Electronics	$31,784,400,000	-8.6%
	Dell	$25,265,000,000	35.9%
	Palm	$1,057,597,000	67.9%

Notes: Revenue figures for Disney, NTT, Vodafone, Microsoft, Oracle, Sony, Dell, and Palm are for fiscal years ending in 2000. All Revenues are for fiscal years ending in 1999. Growth rates SBC and BellSouth are one year growth rates. For all other companies, growth figures are two-year annualized growth rates. Qwest includes the original Qwest and US West.

Sources: Hoovers Online, PiranhaWeb, and company reports.

merger of AOL and Time Warner created a $33 billion Internet media company that packages numerous news, messaging, entertainment, and network services. StarMedia Network, with an annual growth rate of nearly 400%, packages search engines, messaging services, news, web hosting, and e-commerce links in Spanish- and Portuguese-speaking markets in competition with AOL Time Warner and Telefonica Group. Furthermore, Figure 3 shows the importance of network providers in terms of scale of operation and the importance of processing companies and device manufacturers in terms of providing growth for the industry.

The emergence of packagers puts telecommunications companies in two types of markets. The first type is a wholesale market where the company provides networking as a component in combination products that other packagers sell. For example, AT&T provides network facilities to At Home, which combines content with conduit by offering broadband Internet access to 3 million residential customers and more than 6000 businesses, and operating the Excite portal. The second type of market is a direct market where companies sell networking directly to the ultimate customers. BT's Digital Office is such an offering. Digital Office includes a PC and printer, ongoing on-site maintenance and helpdesk support, high speed Internet access, web hosting, Internet domain name, and email.

NEW BUSINESS IMPERATIVES FOR TELECOMMUNICATIONS COMPANIES

The new telecommunications industry creates new business imperatives for telecommunications companies. Even though the jury is still out on many aspects of the new industry, four competitive imperatives are clear. First, major players must achieve global scale in terms of customer base, network, and cost economies. Second, all companies need to collaborate successfully with other players. Third, companies must have excellent customer service. And, fourth, companies must constantly innovate and get innovations to the market quickly.

Customer base is the number, size, and type of customers who connect directly with the company's network. Examples of customer base are Vodafone's 78 million mobile subscribers and Deutsche Telekom's 48 million telephone lines, 25 million mobile subscribers, and 7 million Internet customers. Customer base is important because it determines a telecommunications company's market strength. Market strength affects the company's ability to make markets, negotiate interconnection with other companies, and benefit from market growth.

Several industry events demonstrate the importance of customer base for making markets. Prior to their mergers with other companies, Time Warner's and TCI's combined 23.1 million cable customers allowed the companies to launch new cable networks by providing a ready market. Frontier Communications (now owned by Global Crossing), which used to be just a local telephone company from New York, was able to leverage its local customer base to succeed in long distance. As recently as 1998, Frontier provided both local and long distance to 40 percent of its local customers. Traditional local telephone companies in Finland had similar success when they started competing in long distance. The successes of the Bell Operating Companies in long distance have placed a squeeze on the growth and profitability of traditional long distance companies.

Market strength improves a company's ability to influence industry trends, especially technology trends. Having a say in technology trends is critical for telecommunications companies because combination products' technical standards extend across network, device and software components. If a telecommunications company implements the wrong technical standard, it could encounter technology lockout, a situation where a company gets no customers because customers have embraced someone else's standard. Technology lockout can be very expensive for telecommunications companies because of their large installed networks.

Major players in telecommunications need to have global networks connecting local networks, called footprints, because that is what customers want. Large multi-national customers often want a single network to provide them with end-to-end telecommunications across multiple countries. This drives

telecommunications companies to pursue what WorldCom calls a local-to-global-to-local network strategy (see WorldCom Annual Report 1997). With this strategy, a telecommunications company establishes its own local networks where its customers have business locations and connects these networks via its global network. Companies such as WorldCom and Cable & Wireless apply the local-to-global-to-local strategy primarily by establishing their own local and global networks. Other companies apply this strategy through alliances and partnerships. One noteworthy example is Concert, currently an alliance of BT and AT&T. Vodafone's rapid international expansion illustrates the trend towards global wireless communications.

Figure 4 shows companies following local-to-global-to-local strategies. NTT is the largest, with 23.5 percent of these global players' revenues and 20 percent of the telephone lines. Vodafone is clearly the dominant global wireless company with 31.7 percent of these companies mobile customers. AOL Time Warner is dominating Internet access. Once the government lifts the long distance restrictions on SBC, Verizon, and BellSouth, these companies will become local-to-global-to-local players. SBC will become the third largest player and Verizon could be in the top five. BellSouth is poised to compete against Telefonica and Telmex (which partners with France Telecom and SBC) for global communications involving Latin America and the United States.

The geographic differences in the customer bases of players such as Telefonica, Verizon, NTT, SBC and Concert create important industry dynamics as competition develops. In the first stage of these dynamics, companies develop combination products tailored to the needs of their current customer bases. For example, some NTT combination products focus on the needs of the Japanese markets while others focus on the needs of the company's multinational customers. Some Verizon combination products focus on the major U.S.

FIGURE 4. LOCAL- TO - GLOBAL - TO - LOCAL COMPANIES MOST RECENT REVENUE AND CUSTOMER FIGURES

Global Players and Alliances	1999/2000 Revenues	Telephone Customers	Mobile Customers	Cable TV Customers	Internet Customers
NTT	$97,956,000,000	57,000,000	18,157,000		NA
Concert companies	$92,211,000,000	28,500,000	30,936,000	16,000,000	2,257,000
WorldCom	$37,120,000,000	NA			NA
Deutche Telekom	$35,796,000,000	49,000,000	31,000,000		8,000,000
AOL Time Warner	$33,051,000,000	91,952		12,800,000	31,100,000
France Telecom	$27,242,000,000	34,000,000	24,000,000		1,699,000
Telecom Italia	$25,989,000,000	26,502,000	18,527,000		18,990,000
Telefonica	$23,168,200,000	51,606,000	6,939,000		NA
Sprint	$17,016,200,000	8,000,000	7,400,000		NA
Qwest	$16,422,600,000	29,000,000			NA
Vodafone	$7,873,000,000		63,700,000		
Global Crossing	$1,664,800,000	NA			NA
Emerging Players					
SBC Communications	$49,489,000,000	67,542,000	12,712,400		NA
Verizon	$33,174,000,000	67,000,000	21,300,000		NA
BellSouth	$25,200,000,000	24,000,000	12,495,600		695,000

Notes: Concert company numbers of Internet and mobile subscribers include only the equity percents for BT. NTT's mobile subscribers are its equity percent in DoCoMo. France Telecom mobile customers figure includes only companies for which the company owns a majority stake. Global Crossing is selling its local exchange business. AOL Time Warner Internet customers figure includes Road Runner. SBC Mobile customers represent SBC's equity shares in Cingular Wireless and SBC's foreign affiliates. Verizon's mobile customers figure represents Verizon's equity share of Verizon Wireless and Verizon's international affiliates. Vodafone's mobile customers figure includes Vodafone's equity share of Verizon Wireless customers. Verizon's telephone customers figure includes its equity share of Verizon's international affiliates. BellSouth's mobile customers figure includes its equity share of Cingular Wireless and BellSouth's foreign affiliates.

Sources: Hoovers Online,PiranhaWeb,and company reports.

markets that comprise the bulk of its customer base. Also in this first stage, companies develop competitive products for multi-national customers that transcend geographic boundaries.

In the next stage of the competitive dynamics, the companies begin developing combination products that reach outside their initial geographic bases. This happens because local-to-global-to-local rivalry increases companies' incentives to build local infrastructure in multiple countries. Building this infrastructure lowers the cost of competing for domestic customers. For illustrative purposes, consider the following hypothetical. Suppose that regulators had not allowed SBC to merge outside its five-state region of Texas, Oklahoma, Kansas, Missouri, and Arkansas. The primary key to SBC's success would have been to ensure that no competitor invaded its region, and SBC would have focused considerable resources to that cause. Few competitors would have wasted resources trying to invade SBC's markets. The end result would have been little change in the status quo and a more competition-resistant five-state bloc.

Fortunately, this is not what regulators did. They let SBC merge outside its area. As a result, SBC established footholds in the former Bell Atlantic region, in Europe, and in Latin America, and will probably take steps to solidify footholds wherever SBC's global and national customers have locations. Of course, Bell Atlantic realized this and countered in part by merging with GTE to form Verizon and then forming a U.S. joint venture, Verizon Wireless, with Vodafone.

These mergers trigger a cascading industry dynamic that carries into other markets, pushes other companies, and affects other customers. The result is a global rivalry that drives local infrastructure investments, which can be used to economically serve domestic customers. This means all customers benefit from greater choice and lower costs.

Economies of scale, the third element of global scale, are complex yet important in telecommunications. Academic research points to positive economies of scale in telecommunications, meaning that average costs go down as company size goes up. Recent experience supports this view; telecommunications companies have generally been able to cut costs after mergers. These scale economies are important to companies that chose to compete with global carriers. Cost efficiencies make companies more attractive to customers and to packagers that create combination products. Also, today's larger, competitive companies innovate more than their monopoly predecessors did and achieve scale economies by spreading the fixed costs of product development over more customers.

There are also important demand-side scale economies. These economies, sometimes called network effects, cause network values to increase as more customers connect to the networks. Because networks differ in their reach and features, telecommunications companies benefit from expanding their networks to more countries, regions, and customers.

The new telecommunications industry's business imperatives imply that there will be global players and non-global players. Both types of companies will have to connect their networks with each other, but each company will try to differentiate itself in the types of customers it attracts and the types of combination products it offers either through a packager or as a packager itself. This implies a business structure and a network that are completely different than what the companies created over the past century.

THE OLD TELEPHONE IMPERATIVES

The business imperatives that made a telephone company a success prior to the Telecommunications Act of 1996 (1996 Act) are completely different from today's imperatives. The old imperatives largely centered on the company's ability to work with the government. The government determined franchises, protected the monopoly, limited expansion into other markets, and restricted profits in regulated markets.

Imagine yourself starting a telephone company in the late 1800s. Once you targeted a city and secured the necessary copper wires, operator switchboards, and financing, you negotiated with the city council or mayor to obtain a charter to build your network. The charter determined the boundaries of your network, called your "exchange," by limiting where you had rights of way. At

the time, this was not a problem for your business because the technology of the day made calling long distances impossible. Also, you had little interest in extending beyond the city because the lower customer density would hurt your cash flow. As a result, mutual companies and farmers created the rural telephone companies. Once you had this city's network underway, you selected your next target city and started the process again.

Over the next few years your product line expanded to include long distance, but you stayed locked within your exchange boundaries. If you were part of the Bell System, AT&T required you to use its long-distance lines and would forbid you from building lines outside your exchanges. If you were not in the Bell System, you initially connected to one of the independent long-distance companies, but these companies soon gave up the competitive fight and conceded the market to AT&T. Then in the early 1900s as competition declined, state governments began regulating your company, as did the federal government. The regulators wrote your local exchange boundaries into their rules and, as the quid pro quo for regulation, let you be a monopoly within those boundaries.

This is, in a nutshell, how telephone companies came to have the structures that they do. Exchanges were set up, based upon the limited 1800s technology and city franchises. Next the business added long distance, and the advent of government regulation locked companies into these original boundaries. From then until the passage of the 1996 Act, telephone companies' refusal to give up their monopolies and the government's refusal to let the monopolies expand combined to keep the telephone companies within the old boundaries. Faced with technology and customer changes, the companies and government policy stayed the same.

The government's first effort to keep telephone companies from expanding their mission came in 1956 when AT&T settled an antitrust suit with the Department of Justice by agreeing to stay out of non-telephone businesses. The 1960s ushered in the government's second attempt. An upstart securities quotation company wanted to offer a combined data processing and communications service. Customers liked it, but AT&T objected. The FCC responded by barring AT&T from data processing. But by time the FCC defined what it meant by data processing, technology had changed, making the definition moot. Eventually, the FCC dropped its outright ban on telephone company data processing and imposed separate subsidiary and accounting regulations that made it prohibitively expensive for the companies to integrate computers and communications.

Industry efforts to develop cable television and cellular telephones tell a similar tale. In the 1960s and 1970s, it became clear that customers wanted cable television. This might have been a natural for telephone companies, but the FCC and Congress made sure that they stayed out of it. In the 1970s and 1980s, it became clear that customers wanted cellular telephones. First, the government delayed making cellular technology available until the early 1980s. Then the government used regulations to keep telephone companies from integrating their regular telephone services with mobile services. The end result of the government and industry struggles over monopoly is that the telephone companies of the 1980s and 1990s operated in the same boundaries and provided the same basic services that they did 100 years earlier.

WHY YESTERDAY'S BUSINESS DOES NOT FIT TODAY'S REALITIES

Today's business imperatives for telecommunications companies are completely different from yesterday's business imperatives. Before the 1996 Act, business structure mattered very little because the government controlled the companies' success. Since the 1996 Act, the importance of government has diminished in relative terms and should continue to decrease. Economic imperatives, in turn, are growing in importance. As a result, a business structure that was exactly right for yesteryear's government-controlled monopoly is exactly wrong for the new economics-controlled combination industry. Telephone companies must shed their old structures and remake themselves if they want to succeed in the new industry.

One of the key new imperatives is to achieve global scale. Companies have three basic options for achieving this: build new facilities in new markets; merge or

acquire another company; or develop alliances. Each has its advantages and disadvantages that vary among situations. As a result, companies are likely to pursue combinations of these three options. For example, SBC applies all three approaches. SBC is launching new networks in the top 30 U.S. markets outside its traditional territories. It has partnered to enter markets outside the U.S. and has merged with Ameritech, Pacific Telesis, and Southern New England Telephone. AT&T has also applied all three approaches: it has purchased cable television operations, built local fiber optic networks, and developed an alliance with BT.

In situations where companies choose to build new facilities, the companies benefit from being able to freely choose markets and technologies. On the minus side, building can be slow and expensive. Building can be slow because it requires negotiating rights of way and fees with cities. Furthermore, despite their size, telephone companies simply do not have the financial resources to fund ambitious global expansion plans. Building is also risky if it is the only approach that companies are allowed. The success of building into new markets is not guaranteed. And if multiple companies try to double or triple in size to achieve global scale, one or more of the companies has to fail by actually shrinking. Such a failure would be a severe financial blow. Also, when companies try to enter foreign markets by building, they face the problems of being unfamiliar with business and political practices in the country and of having no established brand name.

The second option, mergers and acquisitions, has obviously been important. In 1990, U.S. telecommunications businesses were involved in acquisitions worth $10.5 billion. By 1994, the value had increased to $32.7 billion and reached $39.1 billion in 1995. In 1998, global mergers and acquisitions in the information technology, communications and media industries jumped 87 percent to $488.8 billion. Most recently, the AOL Time Warner merger was worth $100 billion.

Telecommunications companies benefit from mergers and acquisitions because they achieve scale quickly, remove a potential rival, block competitors from making the same move, provide instant brand recognition in an area, take advantage of existing relationships with authorities that control rights of way and secure local expertise. Securing local expertise can be particularly important in global companies.

Mergers can also be problematic. Research indicates that acquiring shareholders rarely benefit from acquisitions. It is not surprising then that BT's shareholders effectively blocked BT from buying MCI. There is also the challenge of blending corporate cultures and determining corporate officer succession. Mergers and acquisitions can trigger competitive responses from companies that view the new larger company as more threatening than two smaller ones.

The third option, developing an alliance, is common in information industries and appears to be best suited for situations where companies have only a limited common interest or where experimentation is needed. For example, telecommunications companies tend to ally with content companies rather than merge because they have only a limited number of products in common. Alliances tend to be popular for creating combination products because alliances are easier to set up and undo than mergers and can have a limited purpose and duration.

Companies also find that divesting properties is necessary for achieving focus. AT&T's divestiture of Lucent Technologies, Cincinnati Bell's spinning off its data and billing business, and Global Crossing's selling off its web hosting business are examples of companies shedding operations which, while perfectly good businesses, are better off separate from the core company.

KEY LESSONS FOR POLICY MAKERS

Telecommunications'new business imperatives provide some key lessons for policy makers as they examine telecommunications companies' proposals for restructuring their businesses:

- Scale is critical for global players. Telecommunications companies that want to bring the benefits of global services to their customers need to scale up. The world's largest players, NTT and AT&T, have their scale because of their historic positions as national

carriers. With the exception of Deutsche Telekom, the next five largest carriers all achieved their scale largely through mergers -- SBC, WorldCom, and Verizon. Two of these companies, SBC and Verizon, are not yet extending their scale globally because of the nearly two-decade old long-distance restriction.

- The old market definitions no longer apply. Many industry observers have commented on the apparent dearth of local exchange competition and on how various mergers affect competition in local exchange markets or long distance markets. Yet the death of distance means that the distinction between local and long distance is rapidly disappearing, so it has little relevance to assessments of the longer-term impacts of open markets and mergers. Also, the distinction between wire-based telecommunications and wireless telecommunications is disappearing. In some European countries and many developing nations, customers readily substitute cellular and PCS telephones for traditional telephones.
- Market rivalry now spills across markets. Local-to-global-to-local strategies cause competition to cascade across telecommunications markets. Also, competition in combination product markets often cause industry players to facilitate the expansion of competition across geographic areas.
- No company can be all things to all people. Regulators are sometimes tempted to base merger approvals on whether certain companies will compete in particular markets, for example, residential markets. This may actually make customers worse off. Few if any companies will have the appropriate skills and products for all markets. Attempts to force companies to serve markets for which they are not well suited will raise these companies' costs and decrease competition.
- No company will be all things to all people. Giving customers choices and allowing companies to change themselves to match particular customers' needs create opportunities for niche players. Global players form to serve the needs of global customers, but they also serve the needs of other customers who find these players' combination products and prices attractive. But as we have learned from the U.S. long distance competition, a large numbers of smaller companies also form to serve customers who prefer to not buy from the larger players. There are approximately 700 companies in the U.S. that provide long distance service in competition with the large U.S. global providers AT&T, WorldCom and Sprint.
- Some mergers and alliances increase competition. Some mergers and alliances can increase competition through the cascading industry dynamic just described. In essence, the combined companies gain footholds that make them a competitive threat to other companies, thus prompting competitive responses that might otherwise have been avoided. Mergers and alliances can also increase competition by improving companies' abilities to negotiate interconnection in areas where other companies are incumbents. Lastly, combining companies creates large-scale customer bases that can rival other companies' large-scale customer bases.
- Some mergers and alliances increase customer value. By making markets, mergers and alliances that efficiently increase scale allow customers to obtain combination products that might not otherwise be feasible.
- New markets create new businesses and job opportunities. New businesses are springing up to provide combination products, fill market niches, and provide components for combination products. This creates opportunities for entrepreneurs and employees. For example, the Internet market alone – for which some project global investment of $1.5 trillion by 2003 – is offering potent fuel. Also, the new global players will have an employment ripple effect beyond their companies and sectors by helping create jobs in numerous smaller companies offering components and niche services to the larger companies and to consumers.

KEY RESULTS FOR CONSUMERS

What does the new global telecommunications industry mean for consumers? Finally, after nearly 100 years of artificial stability, competition is forcing companies to change to meet the times. Three forces – consumer demand, technical possibilities, and government policies – largely shape how companies can change. To be successful in the new industry, companies must provide combination products at prices that give consumers more value than they receive today. Whether the companies provide these products directly to customers or provide network services to other packagers, consumers benefit from the new rivalry. Customers benefit because this rivalry forces some players to achieve global scale. This gives global customers the network capabilities they need and other customers economy and innovation. The new rivalry forces other players, such as Commonwealth Telephone Enterprises, to stay local and benefit customers that prefer not to buy from the global players. Consumers also benefit from having their choice of the broad mosaic of combination products that packagers are constantly expanding. As customers pick from this mosaic, they prompt some companies to imitate and create more of what customers are buying, and prompt other companies to innovate and try to create the next combination that will be the focus of customer attention. Faced with changing technology, customers, and markets, the companies that succeed will do so by increasing customer value on their way to increasing their shareholder value.

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CONSUMERS, CHANGE AND THE BENEFITS OF CHANGE

The New Global Telecommunications Industry & Consumers

2001 Update – Competition Moves Forward

BY RICHARD TAYLOR

Analysis

CONSUMERS, CHANGE AND THE BENEFITS OF CHANGE

by Richard Taylor

In general, developments since I first wrote Consumers, Change and the Benefits of Change 1999 continue to support the trends described and conclusions reached with respect to the evolving network, its scale, bundling, and regulation. At the same time, the demand side of the equation continues as a major driver, and the long-term evolution of the role of information technology in households continues apace. The role of business in meeting consumers' need for trust is generally acknowledged, but there are some counterpoints developing in the areas of privacy and consumer protection that import a continued governmental role.

The technical convergence of wired and wireless telecommunications, cable television/broadband networks, and the Internet into an interconnected, high-speed digital national and global web proceeds relentlessly in both business and consumer markets. While arguments continue about the state of competition five years after the 1996 Telecommunications Act, broadband markets show strong growth. The Gartner Group predicts some 28 million residential high-speed digital subscribers by 2004, served by cable modems (14 million), digital subscriber line (DSL) services (9.8 million), wireless and satellite services (4.2 million). This is over a quarter of all U.S. households – reflecting a sharp growth curve over virtually zero high-speed residential connectivity in 1997. The introduction of third-generation wireless systems and "Internet in the Sky" satellite systems will make such high-speed access ever-more available in rural areas.

As if to mirror the integration of the networks, the predicted consolidation of "combination" enterprises – vertically and horizontally integrated to take full advantage of economies of scale and scope – can be seen in mergers such as AOL, Time Warner, and CNN; AT&T and TCI; Bell Atlantic and GTE (Verizon); SBC, PacBell and Ameritech; MCI and Worldcom (and almost Sprint); Viacom, CBS, and BET (and Infinity and King World); and Seagram and Vivendi. It is reasonable to expect that the economics driving these combinations have not yet exhausted the possibilities, with companies like Disney, Yahoo!, Bertelsmann, and British Telecom frequently named as additional possible merger targets.

As multi-product companies take control of the multi-purpose network, both the technology and the need to "own the customer" drive the introduction of combined product offerings, which might include, for example, voice service (i.e., telephone), TV programming (e.g., cable or satellite services), wireless, and Internet access. However, the mechanics of such offerings, including pricing, branding, billing, and "back office" issues, have kept them in the "experimental" zone, as companies experiment to test consumer reactions and identify profitable and feasible combinations.

Reflecting the changes in technology, the marketplace, and consumer usage patterns, the larger telecommunications regulatory world has had to re-imagine itself, led by the Federal Communications Commission (FCC). Old formal regulatory boundaries based on single technologies or industry sectors (e.g., broadcasting, cable, satellite, etc.) are increasingly less viable. The FCC has proposed to Congress that it restructure itself along functional lines such as promotion of competition, consumer protection, spectrum management, and universal service. Under FCC Chair Michael Powell, the industry is likely begin viewing the FCC as a facilitator of markets rather than a as public-interest regulator. This perceived change has emboldened some other agencies and Congress to contemplate stepping in to meet perceived needs in the areas of privacy, consumer protection, and anti-trust. The Internet is no longer perceived by some policy makers to have an inviolable shield against regulation and/or taxation.

As new products have entered the markets, and prices for many information technologies have decreased while capabilities have increased, consumer expectations have continued to rise, along with consumer spending overall on information technologies in the household. But, this trend is embedded in the larger economy and can accelerate or decline in response to overall economic conditions. With the increase in connectivity (both broadband and narrowband), the continuing penetration of computers and Internet access devices, the introduction of new services and products, and the move towards "smart" products and "smart" homes, the home has begun to look more like a "node on a network" than ever before – a trend likely to continue.

Although information technologies fulfill multiple functions in those "nodes," they may be combined and used in different ways, responding to different environmental conditions, different needs, and different cultural patterns (often reflected in varying choices by different ethnicities). However, growth of connectivity and use is increasing across all groups – and among both men and women.For those whose access is limited by reasons of income or geography, support for access to telephone service has traditionally been assisted by "universal service." However, there is now a growing recognition that this support may have to be updated and redefined to meet changing circumstances and realities (such as "bundled services"), either through existing mechanisms for review, or through new legislation.

Finally, the original paper noted the rapid growth of electronic commerce, and the central role of "trust" in its viability.It pointed out that in an era of deregulation and reliance on market forces, there are good business reasons to support consumer "trust" in areas of privacy, security and consumer protection. In response to this, we have seen the rise of industry-based or trade-related "sign" or "seal" organizations and programs, which, in return for adherence to voluntary public standards, affirm membership with a logo on the member's website announcing compliance. The carrot is that this is good for business – and the stick is that the Federal Trade Commission has already made it clear that it is prepared to step in, or to ask Congress to step in, to regulate directly if industry fails in its responsibility to self regulate – and once that door is opened, it is not clear where such regulation might end.

This review generally affirms the views set forth in Consumers, Change And The Benefits Of Change 1999, and provides examples which show how they are continuing and in some cases accelerating.

CONSUMERS, CHANGE AND THE BENEFITS OF CHANGE

by Richard Taylor

The needs and desires of consumers are important in both shaping and driving the market for information products and services. This is true of all commercial sectors, but because this is the information sector, it has added dimensions. Information technologies raise important social questions such as access, equity, privacy and security. The answers to those questions affect our collective sense of community, culture and governance. This section addresses some of the more salient considerations with respect to the interests of consumers in the information infrastructure.

THE NEW GLOBAL TELECOMMUNICATIONS INDUSTRY

The Evolving All-Purpose Network

In terms of technology, in most of the United States, telephone systems, cable systems, computer networks and the Internet are both competing and combining into what is likely to become a virtually universal network (the "Net") which combines all of these services into one. The information "pipes" into the home will carry them all, with the distinctions being supplied by the appliance (e.g., telephone, computer, television) connected to it. There are currently multiple information "pipes" available into the home: competing "wired" systems (e.g., copper wire, coaxial cable), wireless (i.e., cellular and personal communications services) and satellite services. These are provided by competing companies, and serve multiple purposes: communications, information, entertainment, education, business, emergency services, and more. Many of these companies are engaged in various kinds of acquisitions and partnerships which will make them larger and more capable. But is this a good thing for consumers?

The Imperative of Scale

In terms of industry structures, the continued move toward integration of carriers and content providers on a global scale – through expansion, merger and acquisition and alliances – is producing a score of competing world-class information enterprises, many of them with primary regional bases either in the Americas, the European Community, or the Asia-Pacific economies. They are competing nationally and internationally – engaged in protecting their home markets while expanding into new ones. The market for data transport services is fiercely competitive, driving prices down, leaving global, integrated companies to seek growth and profitability through value-added services and content. The number of large, core global carriers is necessarily constrained by the huge capital investments required and the global operating challenges. Their number is already vastly exceeded by the quantity and array of companies of all sizes offering products and services over the global network of networks – the Internet.

The Inevitability of Bundling

An inexorable logic is forcing competing providers who market telecommunications, information, and media products to try to offer a "bundle" of services to consumers. These include but are not limited to: voice/telephony (i.e., local, regional, long distance, and international), wireless, video (i.e., "cable" programming, pay-per-view, video-on-demand, satellite TV), Internet access, videoconferencing, high speed data services and various ancillary services (e.g., voice-mail equivalent, web-page hosting, etc.). The logic is inexorable because virtually all of the traditional "products" will soon simply be variations of bits scooped from the "digital river" flowing past virtually all households.

As to those households, multiple surveys report significant consumer interest in receiving bundled telecommunications services. For example, an IDC/Link survey found that over half of survey respondents (53.3 percent) were "very interested in purchasing local and long distance service from one provider," and another 39.8 percent indicated that "they were very interested in purchasing all their telecommunications services from one provider." A Yankee Group survey, which showed similar interest in bundled services among Canadian consumers, reported that "the strongest bundling incentive stems from consumers' apparent desire to receive a single bill."

Currently, there are competing pricing models in the telecommunications marketplace: traditional telephony, based on time of call, time of day, and distance; cable, based on a monthly basic service charge, with added

charges for additional tiers; and the Internet, based on flat-rate pricing. However, the logic of the technology and marketplace is likely to result eventually in a model with a basic connection charge, several levels of flat-rate pricing (based on speed/bandwidth and quality of service) and incremental charges for value-added and content services. Consumers will have far greater choices in picking their providers and their applications than they do now. Because that initial connection to the consumer as the "one-stop" provider is critical, competitors will have incentives to offer not only the lowest price, but the highest quality of service and of customer care.

The new competitive marketplace will empower consumers with choices. There will be more providers, more services, and more value from increased versatility of the services which are offered. There will also be benefits of efficiency. Consumers will be able to replace the array of limited and disparate current relationships with five or six or more companies (which involve separate pricing, billing, and customer service) with an integrated selection from a competing one-stop provider that offers cross-service discounts, one-call service and single billing. Such "baskets" of services can be provided by integrated companies, as well as packagers that combine products to fill unique market niches.

Telecommunications and other companies are remaking themselves for the new environment. The new telecommunications industry, as noted, is a global combination industry. The other information industries – computer, media and publishing – are also becoming combination industries. These companies are already developing combination products that reach outside their initial geographic bases. The business imperatives of creating global scale, packaging, providing excellent customer service, and innovating constantly are interlinked, and are primarily provided by businesses operating on a sufficiently large scale.

Reimagining Regulation in a Competitive World

At the same time, the regulatory regime is evolving. The Federal Communications Commission (FCC) is feeling pressure to respond to challenges to traditional regulatory categories presented by "hybrid" products such as "Internet telephony" and cable modems. As the rules established by the Telecommunications Act of 1996 to promote competition work their way into the marketplace, the FCC is gradually moving toward interpreting the "public interest" standard as primarily requiring the elimination of regulatory barriers to competition. "Universal service," perceived as a remedy to serving populations in high-cost areas and/or with low incomes, is slowly being revised to conform with the realities of competition. It should be noted, however, that the trend toward deregulatory policies will rise or fall, based on the ability of industries and companies to engage in self-regulation, and to act in their own enlightened self interest.

CONSUMERS AS DRIVERS OF CHANGE

The success of the transformation described above – while enabled by technology and facilitated by the elimination of regulatory barriers and predictable, non-discriminatory regulation – will ultimately depend on the ability to satisfy consumer demand. In the desirable case, after a period of transition, the market will become richly competitive. As that occurs, the public interest will be served through the benefits of competition: choice, quality, accessibility, good service, continuous innovation, low prices, and customer responsiveness. The one-stop shopping made possible by the convergence of services will offer more convenience, less expense, and a considerable reduction in costs to consumers – both directly (e.g., lower prices) and indirectly (e.g., time saved, efficiency, lower search costs).

Changing Expectations

The economics of the information and electronic media infrastructure rely on multiple sources, including business and government. However, it appears that the largest single base is the "demand side" of the market where vast numbers of consumers make countless choices every day. Indeed, in recent years, changes in the nature and pattern of consumer demand have been major factors in pushing the development and convergence of high-speed voice, video, and data services.

In the markets of today and tomorrow, consumers increasingly want choices. New generations of

consumers have grown up, used to the flexibility and ease of shopping offered by large enclosed malls and massive supermarkets. Consequently, those consumers want today – and will demand tomorrow – the very same features in their telecommunications and information services.

Continuing, significant changes in consumer demand for telecommunications services are clearly evident. Consumers will soon come to regard "one-stop shopping" for "baskets" of services as obligatory. Such baskets can only be provided by large, integrated companies. At the same time, many new, competitive companies are carving out special niches in the market by offering new types of services.

Changing Uses of Information Technologies

What is it about the consumer market (i.e., the needs and wants of average citizens) that is producing the enormous investment in technology and marketing needed to support these networks and services? At several levels, consumers have been driving these changes. There are underlying trends in populations, families, communities and households who have supported – and will continue to support – the demand for consolidated telecommunications, information and media products and services.

Households as "Nodes" on an Information Network

In recent years, Americans have substantially increased the number of information devices in their homes. Beginning in the 1970s, Americans have gone on a shopping spree that has swelled to a crescendo in the '80s and '90s, producing an abundance and diversity of media in their homes. The growing density of household media has also paralleled an increase in the amount of domestic time spent with media. The image of the household that has emerged in the 1990s is one of a home increasingly dense with multi-functional information devices.

This change has been supported, in part, by the downward trend of household size and increasingly thinner community "human" networks. (The average household size has diminished from 3.35 persons in 1950 to 2.65 persons and is projected to continue dropping through the year 2000. The decline in household size has produced lower-density community networks because the household contains fewer members to connect to the rest of the households in the network. The steady increase in the number of single-person households tends toward thinner, or even nonexistent, community networks. The more people live alone, the more media serve as surrogates for interpersonal communications. The more media become available, the more living alone becomes attractive as a lifestyle. Not surprisingly, individuals living alone tend to be high users of media and communications.

The Home as Window, Workplace, Refuge and Market

Technology leaders increasingly define information technology as the amalgamation of devices and programs that enable people to first distill useful meaning from disparate data and then complete information-intensive tasks. With the personal computer and other new digital technologies, information technology is now capable of effectively merging two spheres of action – play and work – into a single home. This creates a nucleus of activity from which an individual can interact with the larger social network of family, friends, and business associates – effectively serving as a node on a new social network.

Although the linkage of homes into a social network has been part of American life since the inception of town halls and libraries, only within the last ten years has information technology – particularly the Internet – allowed businesses to depict each home as a node, one of millions, on a global information network. As a node, the home utilizes information technology to serve four functions for its occupants:

- Window - a place from which to view and participate in society
- Workplace - a place to complete job tasks and earn income
- Refuge - a place to escape from work and find release and entertainment
- Market - a place to purchase goods and services.

Clearly, the consolidation of enterprises on a sufficient scale tends to facilitate consumers' ability to

accomplish desired functions by enhancing and expanding their ability and choices to do so, while reducing the costs and effort involved.

Changing Populations Use Information Technology Differently

The U.S. population is undergoing several kinds of shifts that will play themselves out during the 21st century. They are projected to give America a very different "face" in terms of ethnicity and areas of population density. The direction of these trends is already apparent. In the 21st century, minority population growth rates will transform familiar terrain, with increasing percentages of Hispanics, African-Americans, Asian-Americans, and Native Americans, especially in urban areas. Research indicates that these different ethnic groups use media differently. Note that differently does not mean less – in some cases ethnic groups use it more – but that priorities differ. This has already resulted in a heightened interest in use by ethnic groups of information technology and media, for several reasons.

First, new information technologies allow the identification of smaller, more targeted segments of markets, causing minority market segments to look relatively larger and more accessible. Second, the growing economic power of minorities has begun to make itself felt. Third, the emergence of the Internet offers opportunities for breaking through old barriers between media, creating opportunities for the user to direct the flow of information and determine the content.

Historically, telephone service has acted as a "passport" to the economy, social networks, and political discourse. In recent decades, cable television has been what the telephone represented to the first decades. However, unlike the telephone, where African-Americans and Latinos have lagged behind whites, cable distribution has shown no significant difference in household penetration. It certainly seems that cable plays a different role in the information environments of African-American and Latino households. Currently, personal computer ownership and use is the penultimate symbol of the information age. The Net may provide a composite that can bridge the gap between access to and use of these technologies.

Ethnic groups are heavy users of media and early adopters of products such as enhanced telephone services and pay-per-view. At present, African-Americans and Latinos continue to lag behind whites in access to the information infrastructure through the telephone and the PC. However, African-Americans and Latinos have shown themselves to be active consumers of media. Their decisions indicate a recognition of specific needs and the ability to construct distinct information environments in their homes.

CONSUMER CONCERNS FOR THE EVOLVING NETWORK

Abuse of Consumer Trust – and Worse

It would be entirely wishful thinking to suggest that there are no consumer concerns in the marketplace. The information infrastructure is undergoing enormous upheaval; businesses are investing large amounts of money; competition is already intense in some sectors; and some competitors will succeed, and some will fail. It is foolish to think that in that kind of environment there will be no risks to consumers.

Protecting the interests of consumers represents a veritable spectrum of concerns: from the fairly specific – honesty in the provision of telecommunications services, assurance of competitive markets, and protection in applications such as electronic commerce – to broad issues, such as privacy, security, and participation through access for all. Corporations cannot, nor should not, shy away from these issues.

Internet-based companies, for example, must strive to develop and honor corporate Internet polices that address these matters of concerns to their customers. These polices should also be written in language that is understandable to average consumers and be clearly posted and easily accessible at Web sites. Although they might boost their competitiveness by taking such actions, many "e-commerce" corporations have yet to do so. Consumers have deep anxieties about their online privacy and security, and polls suggest that these same concerns are placing a drag on the development of e-commerce and the entire Internet. Corporations that take the lead in showing sensitivity for these matters

may also secure a deserved lead in their relations with consumers.

Given the increasing level of competition, it is probable that some version of "slamming" – switching customers from one company to another without their consent or knowledge – will continue to be an issue. Related to that is the potential for over-aggressive and misleading marketing tactics, which take advantage of consumer confusion during the transition. Fair and accurate billing practices –- the transition from several types of billing to a new charging regime – present substantial challenges and opportunities for errors.

The challenge these matters pose is, and will continue to be, to protect the public from real abuses without distorting markets.

As inexperienced or underfunded providers begin to make service offerings, there may well be reliability and quality of service issues. For some, there is a concern that competition may lead to lower service quality as competitors strive to deliver products more cheaply. Another expressed concern is whether or not competitors plan to serve all households, not just the most profitable/and or easiest ones. Certainly, competition can be relied upon to drive penetration, especially as cable systems become providers of "bundled" services and profits come from volume – not just "high end" customers. On the other hand, the traditional economics of serving residential customers needs to be rationalized and the dynamic between providing cost-based service and subsidized service resolved before the residential market will become attractive to all.

Related to this is the concept of "redlining," either based on economics, or for social or historical reasons. Anyone who currently has access to either a telephone or cable television should be a potential customer, and for those households with lower incomes or higher service costs, "universal service" support may be necessary. But the market is quite creative, and low-cost and/or advertising-subsidized communications may yet bring many low-income households onto the network. Corporations and the government need to be alert to the common interest in avoiding a "digital divide" between information "haves" and "have-nots."

Informed Choice" Universal Service

To create a fully successful marketplace for all the users and society, the participants in the system and the regulators must be concerned about fairness and inclusion for all. If corporations behave responsibly and if corporations rise to the challenge and see their long-term interest in building communities, the market will address many of these issues. Indeed, it may be easier for very large corporations to appreciate this and have the resources to do something about it, which smaller companies may lack. In those hopefully rare cases where, for whatever reason, the market fails to provide adequate and timely access (probably where it is most needed), there will be, as noted above, "universal service." Perhaps this will ultimately evolve along the "informed choice" model (proposed by Dr. Jorge Schement), which envisions a basic level of access, with the choice of particular services left to a user's priorities (as noted above, different households and different groups may have different priorities).

Even such a limited role for "universal service" raises complex policy issues about who receives it, who pays, and who manages it, as the fallout from the 1996 Telecommunications Act has already clearly shown. In addition, equity issues need to be carefully balanced with consumer risks, which could come from market-distorting government intervention that is not truly competitively neutral.

Electronic Commerce and Consumer Protection

In addition to protections from abuses in their dealings with telecommunications services providers, consumers are also seeking assurances with respect to their use of Internet-provided services and business, economic and financial transactions. Electronic commerce, both business-to-business and retail, is expanding with extraordinary speed. As part of its evolution, industry-led initiatives are currently evolving with respect to personal information privacy, electronic transactions security, goods/services sellers reliability, and customer care/relations standards. To some extent, this process is being globalized, as business on the Internet can be conducted instantly with any part of the world. This presents a number of challenges (resolving

jurisdictional and conflicts-of-laws issues; issues around taxes and tariffs; differing standards regarding privacy, encryption, acceptable content, protection of children) but at present, there appears to be no reason why, in principle, these differences cannot be resolved through concerted, good-faith negotiations.

CORPORATE RESPONSIBILITY AND REGULATION – CONSUMERS IN THE BALANCE

If things go properly, the digital revolution will make it possible for all voice, video, and data communications to be transmitted together, within packets of data, as if over a seamless network. Consumers will benefit from this new industry, with one-stop shopping for an ever-widening range of applications and services. They will have more choice, more convenience, and lower prices. Regulators will continue to have a role in protecting consumers from abuses and assuring free and fair competitive markets. Under this scenario, it is a win-win situation all the way around. But this rests on a number of assumptions. Whatever weaknesses there may be in the other assumptions, one is certain. If the participating corporations do not act responsibly with respect to consumers and society – by competing aggressively within the law, by responding quickly to consumer needs, by not abusing consumer trust, and by acknowledging the need for fairness and inclusion – the heavy hand of regulation will descend. Information services are not shoes or paper clips; they are a fundamental infrastructure on which rides our community, our values, our economy and, ultimately, our democracy. They are not a "mere" commodity, but are freighted with important policy implications and, consequently, political sensitivities. Failure to recognize this and behave accordingly would turn the Net's gain into a "Net" loss -- for all of us.

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In recent years, Dr. Taylor has conducted studies and published papers and articles on various aspects of electronic commerce, with an emphasis on consumer protection legal issues. Prior to joining Penn State in 1989, he was Vice-President and Corporate Counsel for Warner Cable Communications Inc. He holds a J.D. degree from the New York University School of Law and an Ed.D. degree in Mass Communications from Columbia University. He is a member of the American Bar Association Forum Committee on Communications Law and the Federal Communications Bar Association.

The New Global Telecommunications Industry & Consumers

2001 Update – Competition Moves Forward

BY RICHARD ADLER

TELECOMMUNICATIONS—2011

by Richard Adler

Since the first version of this paper was completed, the pace of technology development has continued unabated. In particular, the powerful trend toward "the digitization of everything" has not diminished, although some glitches have appeared in the marketplace that may slow the rate at which new technologies are adopted. One such area is digital television, the introduction of which has been slowed by the lack of an accepted standard and disputes among broadcasters, set manufacturers, and cable operators about precisely who should be doing what during the transition from analog to digital television service.

On a fundamental level, Moore's Law, which states that the computing power of microprocessors doubles every 18 months, is still alive and well. Each new generation of computers is significantly faster and more powerful than the previous generation. The steady progress being made in the performance of computer hardware can be seen clearly in the most recent notebook computers that weigh only a few pounds but pack more capability than the bulky desktop systems of just a few years ago.

But today, the most significant expansion of the power of computers is no longer based on the increase in capability of individual machines, but rather on their ability to provide access to the ever-expanding resources of the Internet. In fact, even a relatively simple, inexpensive computer can be used to tap into the Internet's vast resources, which now encompass more than one billion pages of information.

The emergence of a service such as Napster is a dramatic example of what can happen when content becomes digital and goes online. By providing anyone connected to the Internet with free, instant access to enormous libraries of music, the service has threatened to disrupt the entire music business, which has been based on the distribution of music in the form of physical recordings.

The number of Internet users has continued to grow steadily. The total Internet population in the U.S. increased 52 percent in 2000. In the summer of 2000, according to Nielsen NetRatings, the penetration of the Internet passed 50 percent of all U.S. households. As the number of users increases, so does the value of the Internet as a communications medium: for example, email is becoming the preferred method of communication for millions of people. The spread of email has already begun to have a measurable impact on the number of physical letters that are handled by the U.S. Post Office each year.

The past year has also been a period of sharply accelerating growth in the penetration of high-speed connections to the Internet. The penetration of residential broadband access (principally via digital subscriber line [DSL] and cable modems) increased more than threefold in the past two years – from less than two million households at the beginning of 1999 to more than six-and-a-half million at the beginning of 2001.

Even though residential broadband is spreading rapidly, its availability remains uneven. High-speed connections are not yet obtainable in many rural areas, and are not universally available even in major metropolitan areas. (I recently moved to a new home located on the edge of Silicon Valley and found out that it was not possible to get high-speed Internet access: the location was too far from the phone company's central office for DSL service and the local cable operator had not yet upgraded its system to allow it to offer cable modem service.)

End-to-end fiber optic networks that will provide even higher-speed access remain in their infancy. Experimental trials of fiber to the home have been launched in a few communities, but these are still

in very early stages. Relatively high costs are keeping penetration low and with few users there is little incentive to develop content that takes advantage of higher bandwidth – a classic chicken and egg problem.

One final trend that gained momentum during the past two years is the growing prominence of wireless services. Handheld devices are proliferating and adding a wide range of new capabilities. Cell phones have already become familiar parts of everyday life while two-way pagers and Web-enabled Personal Digital Assistants (PDAs) are becoming more common and are adding the ability to handle sound and images. One limiting factor that is still being worked out is the tradeoff between building devices that are small and portable and including a screen that is large enough to be readable on the other.

While technology continues to evolve, considerable uncertainty remains about such questions as the specific services that will be popular and the shape of the industry that will provide them. The recent demise of so many Web-based businesses demonstrates that just because something can be done technologically does not mean that it should be done. And the pace of regulatory change still lags behind the pace of technological development. As long as this is the case, it is likely to be later rather than sooner before we are able to enjoy the full benefits that new technologies can offer.

TELECOMMUNICATIONS—2011 by Richard Adler

"It is difficult to make predictions, especially about the future." - Hans Bethe

LOOKING BACKWARD, LOOKING AHEAD

Each time a new technology or a new medium appears on the scene, there seems to be a virtually irresistible temptation to imagine that it will provide us with wonderful new benefits, dramatically alter the quality of daily life, and generally lead us into a new world that is significantly better in a variety of ways than the world in which we currently live. For example, the arrival of cable television in the 1970s inspired considerable enthusiasm about the new era that was about to be ushered in with "the television of abundance." In the 1980s, the advent of the personal computer generated even greater enthusiasm. And the emergence of the Internet and the World Wide Web in the 1990s produced even more intoxicating visions of a new, wired world.

In retrospect, none of the previous technologies quite managed to live up to the glowing visions that they inspired. Yet it is certainly true that the world today is markedly different than it was 20 or 30 years ago and that new technologies have played a significant role in bringing about those changes. And the networks that are emerging today do, in fact, promise to bring about far-reaching changes in many aspects of our lives.

TELECOMMUNICATIONS TECHNOLOGY 2011

The telecommunications environment available to the average consumer in 2011 will be dramatically different than it was a decade earlier in 2001. It will differ from the current environment in several fundamental ways. Each of these changes is important in its own right; cumulatively, though, they will open up a range of new possibilities.

Specifically, the network of the future will be different from the current environment in five ways:

- It will be digital
- It will be broadband (high speed)
- It will be "always on"
- It will be ubiquitous
- It will be intelligent.

Each of these is described below.

A Digital Network

Historically, information has been captured and conveyed in two very different forms: communications media – including telephony, still and motion picture photography, audio recording, and radio and television broadcasting – have captured sounds and images in analog (that is, continuously varying) form. By contrast, computers and computer networks are digital—that is, they store and process and transmit information in the form of "binary bits" made up of zeros and ones. In the past, analog and digital media were largely separate and incompatible, and translating between the two was awkward. A decade from now, however, virtually all media will be digital and the distinctions between different types of content will disappear. And, the all-digital networks that carry this content will be able to carry all of them indiscriminately.

The transition from analog to digital is already well underway in many areas. For example, vinyl records (an analog medium) have been almost entirely replaced by compact discs (a digital medium). In the world of photography, traditional film-based cameras are being challenged by new digital cameras. In Hollywood, the transition from celluloid to digital movie production is well underway. All-digital wireless personal communications services have been introduced that have virtually replaced the older analog cellular services. And, television stations across the country have begun the federally-mandated process of converting from analog to digital broadcasting.

Digital media have several advantages over analog media. First of all, information that is in digital form can be copied perfectly. While each successive generation of information in analog form is degraded to some degree, an unlimited number of copies of digital information can be made with no loss in quality. And digital content can be manipulated in many useful ways: it can be compressed and stored, it can be enhanced, it can be indexed and searched, it can be randomly (i.e., quickly) accessed. To cite just one example of the potential impact of this shift, the music industry is struggling to cope with economic implications of the

ability of consumers to easily copy and share high-quality digital music files.

Content that is in digital form benefits from the ever-increasing power of computer technology. Initially, computers were limited to processing "data" in the form of numbers and text, but the most recent generations of PCs are true multimedia machines, able to work with sound as well as with still and moving images. And thanks to Moore's Law (that states that the computing power of microprocessors doubles every 18 months), computers will keep improving: in ten years, computer performance will increase another 200-fold, giving an even greater edge to digital media.

Similarly, storing digital information continues to get easier and less expensive. In less than a decade, the storage capacity of hard disks has increased from a few megabytes (a million bytes) to several gigabytes (a billion bytes) – a more than thousand-fold increase. By 2011, storage devices that hold terabytes of data (trillions of bytes) will be common and inexpensive.

Just as the technologies for creating and storing content are going digital, the same is true of the networks that distribute this content. Information can be transmitted much more efficiently in digital form than in analog form. For example, two different television programs in digital form can be transmitted over the same channel that can carry just one analog program. And so-called packet switched networks (like the Internet) make it possible for messages from many different users to share a single line, while analog information generally requires each message to have its own "dedicated" circuit. This makes digital communications much less expensive than analog communications.

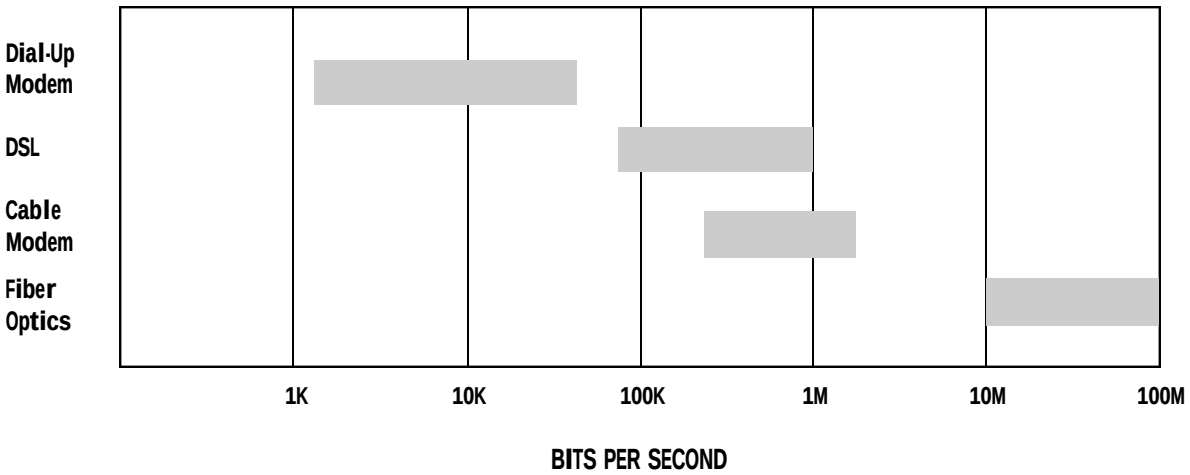
The movement toward an all-digital world is also providing a strong impetus for the convergence of networks that were previously separate. As one observer has pointed out, "bits is bits," no matter what type of content they encode. Voice, video, text and data can all be transported over the same networks as long as they are in digital form. Which network is used to carry which digital content will increasingly be a matter of customer choice based on the economics and performance characteristics of the available alternatives.

A Broadband (High Speed) Network

A decade from now, low-cost, high-speed digital communications networks will be widely available. Broadband connections, installed today in only a small fraction of households, will be virtually universal by 2011. And a growing number of homes will be online via ultra-high speed fiber-optic lines.

The telephone system was originally designed to use just enough bandwidth to carry a person-to-person conversation with an acceptable level of sound quality. For the average consumer at home, the ability to send and receive digital information has been limited to the

FIGURE 1. TRANSMISSION SPEEDS OF DIGITAL MEDIA (LOG SCALE)



relatively slow speeds that could be carried over these lines. Connecting a computer to the Internet has required the use of a modem that converts a computer's digital information into the analog signal required by the phone network. Modem speeds have increased steadily over the past two decades from 300 bits per second to the current standard of 56,600 bits per second (56.6 kilobits per second or kbps) – an increase of nearly 200 times.

But even 56.6 kbps is slow compared to the speeds of one million bits per second (one megabit per second) and higher that are provided by all-digital broadband (i.e., high-speed) technologies that have been largely restricted to business users in the workplace. And 56.6 kbps appears to be close to the maximum speed that can be carried by an analog phone line. For residential users to enjoy higher speeds, new approaches are needed. Several technologies are vying to provide affordable high-speed access for ordinary households (see Figure 1 on page 47).

The telephone network has the advantage of already being in more than 95 percent of U.S. households. And like other media, the telephone system has begun to convert to digital formats. Digital subscriber line (DSL) services make it possible to transmit information at much higher speeds over existing copper phone lines (DSL is also sometimes called xDSL, with the x signifying the different speeds of DSL). By 2011, residential customers using all-digital services such as this will be able to send and receive information over their phone lines at speeds of a megabit per second or more.

Cable television is an inherently broadband medium (compared to telephone), but it was originally designed for the one-way delivery of analog television programs. However, as broadcast television transmission converts to an all-digital format, so will cable TV. And, over the next decade, cable television systems will compete with the telephone network in providing two-way, high-speed digital communications services to consumers.

There are also wireless technologies that can provide high-speed communications even to households located in remote areas. Direct broadcast satellites are already delivering television programming in digital form. These systems will deliver other types of information, as well. Terrestrial wireless systems that are now mainly used for voice service will also provide broadband access to a wide range of data and other services.

Even higher communication speeds will be made possible through fiber optic networks. Fiber optics, which use laser light to send digital data through thin strands of glass, have been in use for many years to provide the highest-speed links for the "trunk" lines that carry long-distance voice and data traffic within telecommunications networks. Over the past decade, carriers have installed thousands of miles of fiber across the continent and under the oceans that are capable of carrying millions of telephone messages simultaneously at data rates in excess of one billion bits (one gigabit) per second. Fiber rings have also been installed in most metropolitan areas, mainly to serve the burgeoning data transport needs of business customers. But up until now, fiber-optic lines have stopped short of serving individual households, primarily because of the relatively high cost of making this "last mile" connection.

Just as Moore's Law has led to dramatic increases in computing power, so advances in photonic technologies will result in spectacular increases in the performance of fiber optics. Over the next decade, fiber will provide

Figure 2: Download Times for Different Transmission Media

TYPE OF CONNECTION	50 pages text (250 KB)	High res photo (1 MB)	3.5 min video (9 MB)
14.4 kbps modem (1996 standard)	2.5 min	10 min	1.5 hr
56.6 kbps modem (2001 standard)	38 sec	2.5 min	23 min
500 kbps xDSL connection	4 sec	17 sec	3 min
1 mbps cable modem	2 sec	8 sec	1 min
10 mbps fiber optic line	0.2 sec	0.8 sec	8 sec

(kbps = thousands of bits per second; mbps = millions of bits per second)

end users with digital communications initially at megabit speeds and eventually at gigabit speeds – or higher. Technology and systems currently under development will make it possible to transmit data at rates in excess of one trillion bits (one terabit) per second.

As transmission speeds increase, the kinds of content that can be efficiently delivered through an interactive telecommunications network will continue to expand. For example, as shown in Figure 2, a 3.5 minute video clip that currently takes more than 20 minutes to download over a 56.6 kbps dial-up modem will take just eight seconds to deliver over a fiber optic line operating at 10 million bits per second (10 mbps).

By 2011, a majority of households will be hooked up to some form of broadband network. An increasing number of households, as well as many offices and schools, will be served by fiber-optic links that operate at speeds that are hundreds of times faster than today's fastest services.

An "Always On" Network

In addition to the high speeds they provide, all-digital networks have another important characteristic: they are online all the time. What this means is that users no longer have to "dial up" a network and log on to a specific service. Rather than having to "go online" to check for email, for example, messages will arrive automatically as they are sent to a user. This capability will also make it possible to provide a variety of remote monitoring services ranging from security services to health monitoring.

In addition, each individual or household will be able (if they wish) to maintain an online presence that can be accessed by others. Any computer connected to the network can act as a "server," providing whatever information its owner wants to make available. Any device within a household can also be connected to a local home network, then to the global network, and be monitored remotely on a continuous basis. For example, power companies could keep track of household energy use and automatically reduce usage during periods of peak demand in return for charging lower rates for power. An appliance manufacturer could provide ongoing monitoring of the performance of major appliances (e.g., furnaces, refrigerators and freezers, washers and dryers) and identify potential problems even before they have become evident to their owners (just as sensor systems in some cars do today).

It Will Be Ubiquitous

By 2011, computer- and network-based services will be available virtually any place and any time. Users will have the ability to access the information they want, wherever they want it, and in whatever form they want it.

Access devices will be available in a wide variety of forms tailored to specific needs. Personal computers and TVs will take new forms, evolving into a variety of smart information/communication devices ranging from systems with large, flat screens with brilliant high-definition displays to small, portable—and wearable—devices that provide communication by both sound and image. Many of these devices will contain huge amounts (by present-day standards) of intelligence and storage, making today's desktop and laptop PCs and personal digital assistants ("PDAs") seem primitive.

These devices will only be the visible tip of a much larger information iceberg. Over the past two decades, we have moved from a world in which computers were large, complex devices that were shared by many users to a world in which "personal computers" are inexpensive enough for many individuals to have their own computers. In the next decade (thanks, again, to Moore's Law), computers will become so small and inexpensive that each of us will have hundreds or thousands of computers at our disposal (see Figure 3). Most of these will be invisible, embedded in all sorts of common devices in our environment and functioning unobtrusively. The cost of a basic microprocessor will be so low that it will represent only a minor part of the cost of most devices.

And these devices will be interconnected: many households will have wireless local area networks to which a variety of devices—ranging from information access terminals and printers to security systems and even appliances–are connected.

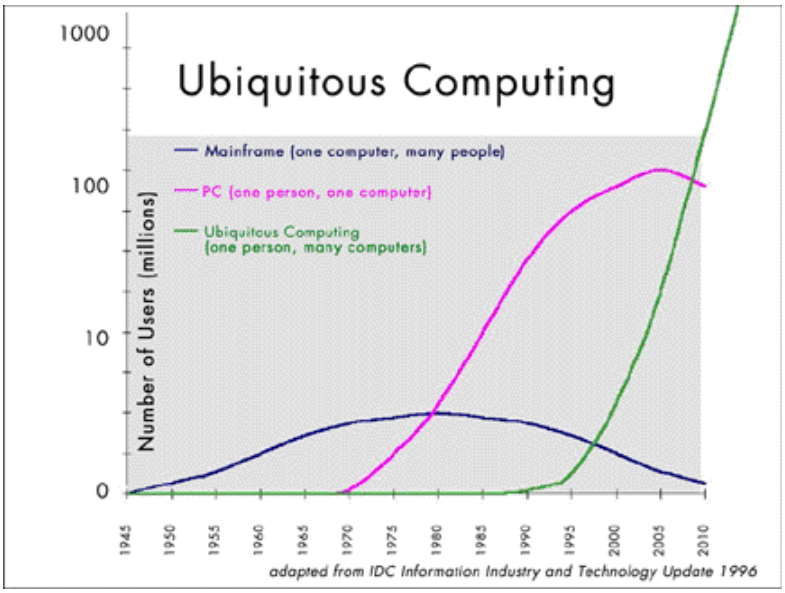


Figure 3. The Three "Waves" of Computing, 1940-2005

Wide area wireless networks will extend the reach of online services to individuals no matter where they are. Today it is possible to carry a portable phone that will operate across the country or even in many parts of the world. A decade from now, wireless devices will provide access to information and communications services from any location.

An "Intelligent" Network

One of the most dramatic developments of the past decade has been the invention of the World Wide Web and the explosive growth of the Internet that provides access to it. Within a few years, more than a billion "pages" of information on an endless variety of topics have been created and made instantly available at the click of a mouse.

But today, most of the content available on the Web is "dumb," an electronic version of the static information previously published in print form. What the Web has done up until now is mainly to provide quicker and easier access to this information. But as the quantity of information online continues to expand, the problem of information overload grows worse. Finding the information one really wants and distinguishing between good and bad information has become increasingly difficult.

To overcome these problems, intelligent tools and techniques will be developed over the next decade that will assist users in locating and using the information and services they need. For example, voice recognition technologies will free users from having to rely on typing on a keyboard to send messages. Natural language systems will allow users to ask a question in their own words and get an answer in a form they can use (rather than their simply entering a word or phrase in a "search engine" and getting a list of links to pages that contain that term). Software-based "agents" will be available that "know" a user's preferences and carry out a range of tasks on his or her behalf without the user having to be present. Automated translation systems will help to eliminate the barriers that exist between people who speak different languages. As these new kinds of tools emerge, we will begin to realize the real promise of the information age.

THE TELECOMMUNICATIONS INDUSTRY IN 2011

The traditional distinctions between different media such as telephone, broadcasting, and cable have already begun to break down. By 2011, they will have virtually disappeared. Instead, there will be a range of providers competing to transport users' bits as well as providing access to a wide range of intelligent services. Given the fact that essentially all information will be transmitted and stored as bits, all of the different media providers (i.e., telephone and cable, wired and wireless) will be competing with one another to see which can provide customers with the fastest, most useful, most efficient, most reliable, and most affordable services.

Companies will compete to handle the transport of all of a customer's bits that will carry voice, data, and video. For the sake of simplicity, many customers will prefer to work with a single provider to supply most or all of their telecommunications services. Other customers will prefer to pick and choose among competitors in order to optimize the services they use or to minimize cost.

Scale will be ever more important. Large multi-national telecommunications companies will provide global networks that serve global companies with "end-to-end" solutions. Increasingly mobile individuals will also demand services that can be accessed wherever they chose to travel or work. In addition, many intermediary companies will exist to offer a host of specialized value-added services.

Many of the old familiar content providers will still exist to provide information and entertainment, while new companies will be established to provide innovative content and services. The advent of the Web in the 1990s provided the environment that led to the creation of companies such as Yahoo!, Amazon, and eBay; other equally innovative service providers will emerge in the future as network capabilities continue to expand.

How rapidly we reach this kind of dynamic, open environment depends, to a degree, on government policy. While the technological advancement that makes these innovative applications possible will continue regardless of government action or inaction, the government will play an important role in determining the rate at which competition between media is permitted and achieved. In the past, the government has often acted to slow or limit competition in order to maintain the distinctive roles of different media. In light of the inevitable digital convergence of previously separate media, the most appropriate role for the government is to "get out of the way" of the introduction of new technologies and support the growth of competition –while maintaining its traditional responsibility for protecting the public interest. And essential to the public interest are policies that will allow the market to produce innovative services at the lowest cost.

Social Implications of the New Telecommunications Environment

By 2011, virtually every household, every business, and every institution (e.g., schools, government agencies, and nonprofit organizations) will be online in some way. In fact, individuals will have the ability to be online all of the time, through a variety of devices and networks, no matter where he or she is. People will need to choose consciously when not to be online -- when to disconnect from the ubiquitous Net in order to give full attention to their immediate environment. Even then, they will be surrounded by aware, intelligent systems that monitor and control their environments, accept and store messages, and perform other useful tasks without requiring human intervention.

A decade from now nearly half of the country's commerce will take place via some sort of network. New kinds of business structures and services will have emerged that will permit us to negotiate and conduct transactions in new ways.

Business competition in an electronic marketplace will be even more fierce as companies are forced to respond in real time to customer demands and to new competitors who may appear anywhere in the world. New forms of immersive entertainment will be available that are especially appealing to the young people -- and of concern to their parents, who will worry about losing control over their children. Advertisers and marketers will have a vastly increased array of tools for creating and delivering messages to highly specific target audiences. In fact, except for a few special occasions (like the Super Bowl, a major disaster, or a presidential inauguration), the old mass audience created by the traditional mass media will have largely disappeared.

Many older institutions will be threatened by these new capabilities or will be on the way to becoming obsolete: to an ever-increasing extent, for example, financial transactions will not require banks, as intelligent software agents will able to continuously monitor and optimize our investments; education will no longer be confined to schools, as high quality instruction will be widely available online; and on demand; and much of

health care will be delivered remotely.

Political institutions will be struggling to maintain their traditional roles as the electorate will have potentially unlimited access to the processes of government and the information on which they are based. While the familiar forms of representative democracy will survive, there will be new opportunities for direct citizen involvement in political activities. For example, community members will be able to participate in local town meetings from the comfort of their homes. Tele-voting will be possible once techniques for authenticating the identity of an online voter are perfected.

An issue that will increase in importance is the challenge of preserving privacy in a world where everything from medical records to money will be digital and where all information is theoretically online and available to anyone. Technology will help protect privacy through encryption and other systems, but laws may also be needed to ensure that privacy continues to be possible as everything becomes interconnected.

One thing that is not likely to change is the impulse people have to get together. While it will be possible to live and work almost anywhere, cities will continue to thrive, because people will continue to be attracted to the amenities they offer. At the same time, the new telecommunications environment will offer opportunities to participate in vibrant virtual communities made up of other people who share common interests. Our involvement in these telecommunities may become as compelling and significant as our "real world" activities.

Finally, an issue that is likely to remain with us is a persistent "digital divide" between information "haves" and "have nots" that first emerged in the 1990s. Those who are able to use the great power that telecommunication makes available will thrive; those who lack these abilities will fall further behind. As more and more of the nation's economic, political, and social affairs take place online, this gap will become even more serious.

Solving this problem will require a two-pronged approach. On one hand, the technologies that we depend on will have to become more reliable and easier to use. One of the great challenges faced by the developers of new systems and new networks is to ensure that they can be effectively used by ordinary citizens without extraordinary effort. At the same time, it will be up to our educational institutions to ensure that all citizens have a chance to acquire the skills they will need to participate fully in an increasingly wired world.

ABOUT THE AUTHOR

Richard Adler has been studying new media and their impacts for over two decades.He is President of People & Technology, a research and consulting firm in Cupertino, California. His clients include both major multi-national corporations and start-up companies in the United States, Canada, and Japan. Mr. Adler has taught communications at Stanford and UCLA and served as a Research Fellow at the Harvard Graduate School of Education. He is also a Research Associate at the Institute for the Future in Menlo Park, CA.Richard holds a BA from Harvard College, an MA from the University of California at Berkeley, and an MBA from the McLaren School of Business at the University of San Francisco.

The New Global Telecommunications Industry & Consumers

2001 Update – Competition Moves Forward

BY JORGE REINA SCHEMENT

CONCLUSION by Jorge Reina Schement

The tide of industry changes poses a crucial challenge for public policy. While the 1984 divestiture of AT&T induced a sweeping change across the telephone industry's landscape, and while the Telecommunications Act of 1996 brought landmark reforms, policy discourse continues to embrace the assumptions of the old analog era. In the absence of language reflecting the new realities, we continue to debate competition, regulation, and the public interest by assuming a terrain that is now behind us. Indeed, we may inadvertently undermine the public interest without even knowing it.

Policy elites from all sectors must strive to grasp the potential of the new communications technologies, how that potential differs from those of the past, and how they contribute to the reshaping of old industries and markets. Those in the private sector must act as responsible corporate citizens, to reimagine and advance the broader public interest.

To ensure a fair competitive environment for corporations, maximum choice for consumers, and equality of access for the public will require a level of policy discourse yet to be achieved. Our moment has arrived - our challenge is to influence that discourse now while we have the chance to shape the future.