

Forthcoming, *Handbook of IS Management*.

US Telecommunications Today, April 1999*

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April 1999

Abstract

This short essay examines the current conditions in the US telecommunications sector (April 1999). We examine the impact of technological and regulatory change on market structure and business strategy. Among others, we examine the impact on pricing of digitization and the emergence of internet telephony. We briefly examine the impact of the 1996 Telecommunications Act on market structure and strategy in conjunction with the history of regulation and antitrust intervention in the telecommunications sector. After discussing the impact of wireless technologies, we conclude by venturing into some short term predictions. We express concern about the derailment of the implementation of the 1996 Act by the aggressive legal tactics of the entrenched monopolists (the local exchange carriers), and we point to the real danger that the intent of Congress in passing the 1996 Act to promote competition in telecommunications will not be realized. We also discuss the wave of mergers in the Telecommunications and cable industries.

* Some of this article is based on "US Telecommunications Today," *Business Economics*, April 1998.

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US Telecommunications Today

1. Introduction

Presently, the US Telecommunications sector is going through a revolutionary change. There are three reasons for this. The first reason is the rapid technological change in key inputs of telecommunications services and in complementary goods, which have reduced dramatically the costs of traditional services and have made many new services available at reasonable prices. Cost reductions have made feasible the world wide web (“WWW”), and the various multimedia applications that “live” on it.

The second reason for the revolutionary change has been the sweeping digitization of the telecommunications and the related sectors. The underlying telecommunications technology has become digital. Moreover, the consumer and business telecommunications interfaces have become more versatile and closer to multifunction computers than to traditional telephones. Digitization, and integration of telecommunications services with computers creates significant business opportunities and imposes significant pressure on traditional pricing structures, especially in voice telephony.

The third reason for the current upheaval in the telecommunications sector was the passage of a major new law to govern telecommunications in the US, the Telecommunications Act of 1996 (“1996 Act”). Telecommunications has been traditionally subject to a complicated Federal and State regulatory structure. The 1996 Act attempted to adapt the regulatory structure to technological reality, but various legal challenges by the incumbents have so far delayed, if not nullified, its impact.

Before going into a detailed analysis, it is important to point out the major driving forces in US telecommunications today.

1. Dramatic reductions in the costs of transmission and switching.
2. Digitization.
3. Restructuring of the regulatory environment through the implementation of the 1996 Telecommunications Act coming twelve years after the breakup of AT&T.
4. Move of value from underlying services (such as transmission and switching) to the interface and content.
5. Move toward multi-function programmable devices with programmable interfaces, such as computers, and away from single-function, non-programmable consumer devices, such as traditional telephone appliances.
6. Re-allocation of electromagnetic spectrum, allowing for new types of wireless competition.
7. Interconnection and interoperability of interconnected networks; standardization of communications protocols.
8. Network externalities and critical mass.

These forces have a number of consequences:

1. Increasing pressure for cost-based pricing of telecommunications services.
2. Price arbitrage between services of the same time immediacy requirement.
3. Increasing competition in long distance services.
4. The possibility of competition in local services.
5. The emergence of internet telephony as a major new telecommunications technology.

This short essay will touch on technological change and its implications in the next section. In section 3, I discuss the Telecommunications Act of 1996 and its implications. In section 4, I discuss the impact of wireless. In section 5, I make some predictions and short term forecasts for the US telecommunications sector.

2. Technological Change

The last two decades have witnessed (i) dramatic reductions in costs of transmission through the use of technology; (ii) reductions in costs of switching and information processing because of big reductions of costs of integrated circuits and computers; and (iii) very significant improvements in software interfaces. Cost reductions and better interfaces have made feasible many data- and transmission-intensive services. These include many applications on the world wide web, which were dreamed of many years ago, but only now became economically feasible.

The general trend in cost reductions has allowed for entry of more competitors in many components of the telecommunications network and an intensification of competition. Mandatory interconnection of public telecommunications networks, and the use of common standards for interconnection and interoperability created a “network of networks,” that is, a web of interconnected networks. The open architecture of the network of networks allowed for entry of new competitors in markets for particular components, as well as in markets for integrated end-to-end services. Competition intensified in many, but not all, markets.

2.1 Digital Convergence and “Bit Arbitrage”

Entry and competition were particularly helped by (i) the open architecture of the network; and (ii) its increasing digitization. Currently, all voice messages are digitized close to their origination and are carried in digital form over most of the network. Thus, the data and voice networks are one, with voice treated as data with specific time requirements. This has important implications on pricing and market structure.

Digital bits (zeros or ones) traveling on the information highway can be parts of voice, still pictures, video, or of a database or other computer application, and they appear identical, “a bit is a bit is a bit.” However, because some demands are for real-time services while others are not, the saying that “a bit is a bit is a bit” is only correct among services that have the same index of time *immediacy*. Digitization implies arbitrage on the price of bit transmission among services that have the same time immediacy requirements.

For example, voice telephony and video conferencing require real-time transmission and interaction. Digitization implies that the cost of transmission of voice is hundreds of times smaller than the cost of transmitting video of the same duration. This implies that if regulatorily-imposed price discrimination is eliminated, arbitrage on the price of bits will occur, leading to extremely low prices for services, such as voice, that use relatively very few bits. Even if price discrimination remains imposed by regulation, arbitrage in the cost and pricing of bits will lead to pressures for a *de facto* elimination of discrimination. This creates significant profit opportunities for the firms that are able to identify the arbitrage opportunities and exploit them.

2.2 Internet Telephony

The elimination of price discrimination between voice and data services can lead to dramatic reductions in the price of voice calls precipitating significant changes in market structure. These changes were first evident in the emergence of the Internet, a ubiquitous network of applications based on the TCP/IP protocol. Started as a text-based network for scientific communication, the Internet grew dramatically in the late 80s and 90s, once not-text-only applications became available.¹ The Internet now reaches about half a billion computers, most of which are connected to it through the telephone network. Internet-based telecommunications are based on packet switching. There are two modes of operation: (i) a time-delay mode in which there is a guarantee that system will do whatever it can to deliver all packets; and (ii) a real-time mode, in which packets can in fact be lost without possibility of recovery.

Most telecommunications services do not have a real time requirement, so applications that “live” on the Internet can easily accommodate them. For example, there are currently a number of companies that provide facsimile services of the Internet, where all or part of the transport of the fax takes place over the Internet. Although the Internet was not intended to be used in real-time telecommunications, despite the loss of packets, presently telecommunications companies use the Internet to complete ordinary voice telephone calls. Voice telecommunications service started on the Internet as a computer to computer call. As long as Internet telephony was confined to calls from a PC to a PC, it failed to take advantage of the huge network externalities of the public switched network (“PSTN”) and was just a hobby.

¹ Critical points in this development were the emergence of GOPHER in the late 80s and MOSAIC by 1990.

About four years ago, Internet telecommunications companies started offering termination of calls on the public switched network, thus taking advantage of the immense externalities of reaching anyone on the PSTN. In 1996, firms started offering Internet calling that originated and terminated on the public switched network, i.e., from and to the regular customers' phone appliances. The last two transitions became possible with the introduction of PSTN-Internet interfaces and switches by Lucent and others. In 1998, Qwest and others started using the Internet Protocol ("IP") switching to carry telephone calls from and to the PSTN using their own network for long distance transport as an Intranet.

Internet calls are packet based. Because they utilize the real time mode of the Internet, there is no guarantee that all the packets of a voice transmission will arrive to the destination. Internet telephony providers use sophisticated voice sampling methods to decompose and reconstitute voice so that packet losses do not make a significant audible difference. Since such methods are by their nature imperfect, the quality and fidelity of an Internet call depends crucially on the percentage of packets that are lost in transmission and transport. This, in turn, depends, among other factors, (i) on the allocation of Internet bandwidth (pipeline) to the phone call; and (ii) on the number of times the message is transmitted.² Because of these considerations, one expects that two types of

² A large enough bandwidth increases the probability that fewer packets will be lost. And, if each packet is sent a number of times, it is much more likely that each packet will arrive at the destination at least once, and the quality of the phone call will not deteriorate. Thus, the provider can adjust the quality level of an internet call by guaranteeing a lot of bandwidth for the transmission, and by sending the packets more than once. This implies that the quality of an internet call is *variable* and can be adjusted upward using the variables mentioned. Thus, high quality voice telephony is immediately feasible in intranets since intranets can guarantee a sustained large enough bandwidth. There is no impediment to the quality level of a phone call which is picked from the PSTN at the local switch, carried over long distance on leased lines, and re-delivered to the PSTN at the destination local switch, using the recently introduced Lucent switches. For internet calls that originate or terminate in computers, the method of re-

Internet telephony will survive. First, the low end quality, carried over the Internet, with packets lost and low fidelity. Second, a service of comparable quality with traditional long distance, carried on a company's Intranet on the long distance part.

Internet-based telecommunications services pose a serious threat to traditional national and international long distance service providers. In the traditional US regulatory structure, a call originating from a computer to an Internet service provider ("ISP") (or terminating from an ISP to a computer) is not charged an "access charges" by the local exchange carrier. This can lead to substantial savings.

FCC, in its decision of February 25, 1999, muddles the waters by finding that "Internet traffic is intrinsically mixed and appears to be largely interstate in nature" on the one hand, while, on the other hand, it validates the reciprocal compensation of ISPs which were made under the assumption that customer calls to ISPs are treated as local calls. If Internet calls are classified as interstate (i.e., as long distance data calls), the price that most consumers will have to pay to reach the Internet would become a significant per minute change and it is likely that the Internet will stop its fast growth. In fact, one of the key reasons for Europe's lag in Internet adoption is the fact that in most countries, unlike the US, consumers are charged per minute for local calls.

In response to the Internet telephony threat, on January 26, 1998, AT&T announced that it will offer a new long distance service carried over the Internet and AT&T's Intranet. AT&T's service offered at 7.5-9 cents per minute, will originate and terminate on the public switched network ("PSTN") and therefore will appear to

sending packets can be used on the Internet to increase the quality of the phone call, as long as there is sufficient bandwidth between the computer and the local telephone company switch. The fidelity of calls

customers like regular call; no computer will be required. In November 1997, Deutsche Telecom (“DT”) introduced Internet long distance service within Germany. To compensate for the lower quality of voice transmission, DT offers internet long distance at 1/5 of its regular long distance rates. Internet telephony is the most important challenge to the telecommunications sector.

3. The 1996 Telecommunications Act and its Impact

3.1 Goals of the Act

The Telecommunications Act of 1996 attempts a major restructuring of the US telecommunications sector. The 1996 Act will be judged favorably to the extent that it allows and facilitates the acquisition by consumers of the benefits of technological advances. Such a function requires the promotion of competition in all markets. This does not mean immediate and complete deregulation. Consumers must be protected from monopolistic abuses in some markets as long as such abuses are feasible under the current market structure. Moreover, the regulatory framework must safeguard against firms exporting their monopoly power in other markets.

In passing the Telecommunications Act of 1996 (“1996 Act”) Congress took radical steps to restructure U.S. telecommunications markets. These steps may result in very significant benefits to consumers of telecommunications services, telecommunications carriers, and telecommunications equipment manufacturers. But the degree of success of the 1996 Act depends crucially on its implementation through decisions of the Federal

can also be enhanced by manipulation of the sound frequencies. This can be done, for example, through the *elemedia* series of products by Lucent.

Communication Commission and State Public Utility Commissions and the outcome of the various court challenges that these decisions face.

The 1996 Act envisions a network of interconnected networks that are composed of complementary components and generally provide both competing and complementary services. The 1996 Act uses both *structural* and *behavioral* instruments to accomplish its goals. The Act attempts to reduce regulatory barriers to entry and competition. It outlaws artificial barriers to entry in local exchange markets, in its attempt to accomplish the maximum possible competition. Moreover, it mandates interconnection of telecommunications networks, unbundling, non-discrimination, and cost-based pricing of leased parts of the network, so that competitors can enter easily and compete component by component and service by service.

The 1996 Act imposes conditions to ensure that de facto monopoly power is not exported to vertically-related markets. Thus, the Act *requires* that competition be established in local markets *before* the incumbent local exchange carriers are allowed in long distance.

The Act preserves subsidized local service to achieve “Universal Service,” but imposes the requirement that subsidization is transparent and that subsidies are raised in a competitively neutral manner. Thus, the Act leads the way to the elimination of subsidization of Universal Service through the traditional method of high access charges.

The 1996 Act crystallized changes that had become necessary because of technological progress. Rapid technological change has always been the original cause of regulatory change. The radical transformation of the regulatory environment and market conditions that is presently taking place as a result of the 1996 Act is no exception.

3.2 History

Telecommunications has traditionally been a regulated sector of the US economy. Regulation was imposed in the early part of this century and remains until today in various parts of the sector.³ The main idea behind regulation was that it was necessary because the market for telecommunications services was a natural monopoly, and therefore a second competitor would not survive.

As early as 1900, it was clear that all telecommunications markets were *not* natural monopolies, as evidenced from the existence of more than one competing firms in many regional markets, prior to the absorption of most of them in the Bell System. Over time, it became clear that some markets that may have been natural monopolies in the past, are *not* natural monopolies any more, and that it is better to allow competition in those markets while keeping the rest regulated.

The market for telecommunication services and for telecommunications equipment went through various stages of competitiveness since the invention of the telephone by Alexander Graham Bell. After a period of expansion and consolidation, by the 1920, AT&T had an overwhelming majority of telephony exchanges and submitted to State regulation. Federal regulation was instituted by the 1934 Telecommunication Act which established the Federal Communications Commission.

Regulation of the U.S. telecommunications market was marked by two important antitrust lawsuits that the U.S. Department of Justice brought against AT&T. In the first

³ The telecommunications sector is regulated both by the Federal Government through the Federal Communications Commission (“FCC”) and by all States, typically through a Public Utilities Commission (“PUC”) or Public Service Commission. Usually a PUC also regulates electricity companies.

one, *United States v. Western Electric*, filed in 1949, the U.S. Department of Justice (“DOJ”) claimed that the Bell Operating Companies practiced illegal exclusion by buying only from Western Electric, a part of the Bell System. The government sought a divestiture of Western Electric, but the case was settled in 1956 with AT&T agreeing not to enter the computer market, but retaining ownership of Western Electric.

The second major antitrust suit, *United States v. AT&T*, was started in 1974. The government alleged that (i) AT&T’s relationship with Western Electric was illegal, and (ii) that AT&T monopolized the long distance market. The DOJ sought divestiture of both manufacturing and long distance from local service. The case was settled by the Modified of Final Judgement (“MFJ”). This decree broke away from AT&T seven regional operating companies (“RBOCs”). Each RBOC was comprised of a collection of local telephone companies that were part of the original AT&T. Regional Bell Operating Companies remained regulated monopolies, each with an exclusive franchise in its region.

Microwave transmission was a major breakthrough in long distance transmission that created the possibility of competition in long distance. Microwave transmission was followed by technological breakthroughs in transmission through satellite and through fiberoptic wire.

The breakup of AT&T crystallized the recognition that competition was possible in long distance, while the local market remained a natural monopoly. The biggest benefits to consumers during the last fifteen years have come from the long distance market, which, during this period was transformed from a monopoly to an effectively competitive market. However, often consumers do not reap the full benefits of cost reductions and competition because of an antiquated regulatory framework that, ironically, was supposed

to protect consumers from monopolistic abuses and instead protects the monopolistic market structure.

Competition in long distance has been a great success. The market share (in minutes of use) of AT&T fell from almost 100% to 53% at the end of 1996. Since the MFJ, the number of competitors in the long distance market has increased dramatically. There are four large facilities-based competitors, AT&T, MCI-WorldCom, Sprint, and Frontier.⁴ There is also a large number of “resellers” that buy wholesale service from the facilities-based long distance carriers and sell to consumers. For example, currently, there are about 500 resellers competing in the California interexchange market, providing very strong evidence for the ease of entry into this market. At least 20 new firms entered the California market in each year since 1984. At present, there are at least 5 “out of region” RBOCs providing service in California through affiliates. In California, the typical consumer can choose from at least 150 long distance companies.

Prices of long distance phone calls have decreased dramatically. The average revenue per minute of AT&T’s switched services has been reduced by 62% between 1984 and 1996. AT&T was declared “non-dominant” in the long distance market by the FCC in 1995.⁵ Most economists agree that presently the long distance market is *effectively competitive*.

Local telephone companies that came out of the Bell System (Regional Bell Operating Companies, “RBOCs”) actively petitioned the U.S. Congress to be allowed to enter the long distance market, from which they were excluded by the MFJ. The MFJ

⁴ Frontier is a new name for Rochester Telephone.

⁵ See Federal Communications Commission (1995).

prevented RBOCs from participation in long distance because of the anticompetitive consequences that this would have for competition in long distance. The anticompetitive effects would arise because of the control by RBOCs of essential “bottleneck” inputs for long distance services, such as terminating access of phone calls to customers that live in the local companies to long distance companies, and are essential bottleneck inputs for long distance service. RBOCs monopoly franchises.

A long distance phone call is carried by the local telephone companies of the place it originates and the place it terminates, and only in its long distance part by a long distance company. Thus, “originating access” and “terminating access” are provided by local exchange carriers to long distance companies and are essential bottleneck inputs for long distance service. Origination and termination of calls are extremely lucrative services.⁶ Terminating access has an average cost (in most locations) of \$0.002 per minute. Its regulated prices vary. A typical price is \$0.032 per minute, charged by NY Telephone. Such pricing implies a profit rate of 1500%.⁷ Access charges reform is one of the key demands of the pro-competitive forces in the current deregulation process.

The great success of competition in long distance allowed US Congress to appear “balanced” in the Telecommunications Act of 1996 by establishing competition in local telephony, while allowing RBOCs into long distance after they meet certain conditions. However, the transition of local markets to effective competition will not be as easy or as

⁶ These fees are the single largest cost item in the ledgers of AT&T.

⁷ Termination pricing varies. Pacific Bell, under pressure from the California Public Utilities Commission, now has an access charge of \$0.016 per minute, giving it a profit rate of 700%.

quick as in the long distance markets. This is because of the nature of the product and the associated economics.

Many telecommunications companies are presently trying to be in as many markets as possible so that they can bundle the various products. Companies believe that consumers are willing to pay more for bundled services for which the consumer receives a single bill. Bundling also discourages consumers from migrating to competitors, who may not offer the complete collection of services, so consumer “churn” is expected to be reduced.

3.3 Entry in Local Services as Envisioned by the Act

Currently, the “last mile” of the telecommunications network that is closest to the consumer (the “local loop”) remains a bottleneck controlled by a local exchange carrier (“LEC”). The Telecommunications Act of 1996 boldly attempts to introduce competition in this last bottleneck, and, before competition takes hold, the Act attempts to imitate competition in the local exchange.

To facilitate entry in the local exchange, the Act introduces two novel ways of entry besides entry through the installation of own facilities. The first way allows entry in the retailing part of the telecommunications business by requiring incumbent local exchange carriers (“ILECs”) to sell at wholesale prices to entrants any retail service that they offer. Such entry is essentially limited to the retailing part of the market.

The second and most significant novel way of entry introduced by the Act is through leasing of unbundled network elements from incumbents. In particular, the Act requires that ILECs (i) unbundle their networks; and (ii) that they offer for lease to

entrants network components (unbundled network elements, “UNEs”) “at cost plus reasonable profit.”⁸ Thus, the Act envisions the telecommunications network as a decentralized network of interconnected networks.

Many firms, including the large interexchange carriers AT&T and MCI-WorldCom attempted to enter the market through “arbitration” agreements with ILECs under the supervision of State Regulatory Commissions, according to the procedure outlined by the Act. The arbitration process proved to be extremely long and difficult, with continuous legal obstacles and appeals raised by the ILECs. To this date (April 1999), over three years after the signing of the Act by President Clinton, arbitrations have been concluded in few States, and entry in the local exchange has been minimal.

3.4 Entry of RBOCs in Long Distance Service

RBOCs (Ameritech, Bell Atlantic, BellSouth, SBC and USWest) have 89% of telephone access lines nationwide. Most of the remainder belongs to GTE and independent franchise holders. Competitive access providers (who did not hold a franchise monopoly) have less than 1% of residential access lines nationwide. Besides providing access to long distance companies, local exchange carriers also provide lucrative “custom local exchange services” (CLASS), such as call waiting, conference calling, and automatic number identification. Basic local service provided by LECs is considered not to be particularly profitable.

⁸ The FCC and State Regulatory Commissions have interpreted these words to mean Total Element Long Run Incremental Cost (“TELRIC”) which is the forward looking, long run, (minimized) economic cost of an unbundled element and includes the competitive return on capital.

The Act allows for entry of RBOCs in long distance once a list of requirements has been met, and the petitioner has proved that its proposal is in the public interest. These requirements can be met only when the market for local telecommunications services becomes sufficiently competitive. If the local market is not competitive when an incumbent LEC monopolist enters into long distance, the LEC can leverage its monopoly power to disadvantage its long distance rivals by increasing their costs in various ways, and by discriminating against them in its pricing. If the local market is not competitive when an incumbent LEC monopolist enters into long distance, an LLEC would control the price of a required input (switched access) to long distance service while it would also compete for customers in long distance. Under these circumstances, an ILEC can implement a *vertical price squeeze* on its long distance competitors whereby the price to cost ratio of long distance competitors is squeezed so that they are driven out of business.⁹

In allowing entry of local exchange carriers into the long distance market, the Act tries not to endanger competition that has developed in long distance by premature entry of RBOCs in the long distance market. However, on this issue, the Act's provisions guarding *against premature entry* may be insufficient. Hence, to guard against anti-competitive consequences of premature entry of RBOCs in long distance there is a need of a deeper analysis of the consequences of such entry on competition and on consumers' and social welfare.

4. The Impact of Wireless (Cellular, Satellite and PCS) and of Cable Television

⁹ Avoiding a vertical price squeeze of long distance competitors, such as MCI, was a key rationale for the 1981 breakup of AT&T in the long distance division that kept the AT&T name, and the seven RBOCs that remained local monopolists in local service. See Economides (1998), (1999).

During the last fifteen years there has been a tremendous (and generally unanticipated) expansion of the mobile phones market. The very significant growth has been limited by relatively high prices resulting from (i) the prevention of entry of more than two competitors in each metropolitan areas; and (ii) the standard billing arrangement that imposes a fee on the cellular customer for *receiving* (as well as initiating) calls.

However, during the last three years, the FCC has auctioned parts of the electromagnetic spectrum that will enable the transmission of personal communication services (“PCS”) signals.¹⁰ The auctioned spectrum will be able to support up to five additional carriers in the major metropolitan markets.¹¹ Although the PCS spectrum band is different than the traditional cellular bands, PCS is predicted to be a low cost, high quality, mobile alternative to traditional phone service. Other wireless services may chip away at the ILECs markets, especially in high capacity access services.¹² The increase in the number of competitors has already created very significant decreases in prices of mobile phone services.

By its nature, PCS is positioned between fixed local service and traditional wireless (cellular) service. Presently there is a very significant price difference between the two

¹⁰ Despite this and other auctions of spectrum, the FCC does not have a coherent policy of efficient allocation of electromagnetic spectrum. For example, recently, the FCC gave for free huge chunks of electromagnetic spectrum to existing TV stations so that they may provide high definition television. Some of the recipients have publicly stated that they intend to use the spectrum to broadcast regular TV channels and information services, rather than HDTV.

¹¹ We don't expect to see five entrants in all markets because laxity in the financial requirements of bidders resulted in default of some of the high bidders in the PCS, prompting a significant dispute regarding their financial and other obligations.

¹² The so-called “wireless loop” proposes to bypass the ILECs cabling with much less outlay for equipment. Trials are underway to test certain portions of the radio spectrum where were originally set aside for other applications: MMDS for “wireless cable” and LMDS as “cellular television.”

services. Priced between the two, PCS will first draw consumers from cellular in large cities, and later on will be a serious threat to fixed local service. AT&T has recently announced that it will use some of the spectrum that it acquired in the PCS auctions to implement a fixed wireless service (“telepoint”), a close (and maybe superior) substitute to fixed wire service.¹³

Industry analysts have been predicting the impending entry of cable television in telephony for many years. Despite numerous trials, such entry in traditional telecommunications services has not materialized. There are a number of reasons for this. First, to provide telephone service, cable television providers needed to upgrade their networks from analog to digital. Second, they need to add switching. Third, most of the cable industry has taken a high debt load and is unable to make the required investments in the short run.

If and when it is able to provide switching, cable television will have a significant advantage over regular telephone lines. Cable TV lines that reach the home have a significantly higher bandwidth capacity than regular twisted pair lines. This is not important for regular voice telephony, but it is crucially important for applications on the world wide web that require high bandwidth capacity. Companies such as @home and WebTV are utilizing this capacity to provide bundles of Internet and traditional TV services. Often these services do not allow for two-way communication but rather rely on a telephone line for transmissions from the home to the Internet Service Provider (“ISP”) which are expected to require only low bandwidth. The merged AT&T –TCI plans to

¹³ The second impediment to wider use of mobile phones seems also likely to disappear. On January 26, 1998, AT&T announced that it will offer mobile service with billing of incoming calls to the originator of the call.

provide telephony, broadband video, and Internet services over the cable line to the home.

We discuss this in the next section on mergers.

5. The Current Wave of Mergers

These challenges have derailed the implementation process of the Act and have increased significantly the uncertainty in the telecommunications sector. Long distance companies have been unable to enter the local exchange markets by leasing unbundled network elements (“UNEs”), since the arbitration process that started in April 1996 has resulted in final prices in only a handful of States. No State has completed the implementation of the Telecommunications Act of 1996. Only 15 of the 50 States have adopted permanent prices for unbundled network elements.¹⁴

In the absence of final prices, given the uncertainty of the various legal proceedings, and without final resolution on the issues of non-recurring costs and of the electronic interface for switching local service customers across carriers, entry in the local exchange through leasing of unbundled network elements has been minimal. Moreover, entry in the retailing part of the business through total service resale has also been minimal, since the wholesale discounts have been small.

¹⁴ These were Colorado, Delaware, Florida, Georgia, Kentucky, Louisiana, Missouri, Montana, New Jersey, New Hampshire, New York, Oregon, Pennsylvania, Texas, and Wisconsin. Of the states that have adopted permanent prices for UNEs, 5 are in the Bell Atlantic/ NYNEX territory (Delaware, New Hampshire, New Jersey, New York, Pennsylvania). Also note that only 4 states have adopted permanent rates in arbitrations of entrants with GTE (Florida, Montana, Oregon, and Texas). For more details see Hubbard and Lehr (1998).

In the absence of entry in the local exchange market as envisioned by the Act, the major long distance companies are buying companies that give them some access to the local market.

MCI merged with WorldCom, which had just merged with Brooks Fiber and MFS, which in turn also own some infrastructure in local exchange markets. MCI-WorldCom is focusing on the Internet and the business long distance market.¹⁵

AT&T has acquired TCG, which owns local exchange infrastructure that reaches business customers. Recently AT&T has unveiled an ambitious strategy of reaching consumers' homes by using cable TV wires for the "last mile." With this purpose in mind, AT&T bought TCI. AT&T promises to convert the TCI cable access to an interactive broadband, voice, and data telephone link to residences. AT&T has also entered in an agreement with Time Warner to use its cable connection in a way similar to TCI's. On April 22, 1999, AT&T announced its bid for MediaOne, the cable spin-off of US West which had earlier announced its merger with Comcast.

TCI cable presently reaches 35% of US households. Together with Time Warner and MediaOne, AT&T will reach a bit more than 50% of US households. Without access to UNEs, to reach all residential customers, AT&T would have to find another way to reach the remaining US households. Further cable conversions is one strategy that can

¹⁵ The MCI-WorldCom merger was challenged by the European Union Competition Committee, the Department of Justice and GTE on the grounds that the merged company would have a large market share of the Internet "backbone" and could sequentially target, degrade interconnection, and kill its backbone rivals. Despite (i) a lack of an economically meaningful definition of the Internet "backbone"; (ii) the fact that MCI was unlikely to have such an incentive because any degradation would also hurt its customers; and (iii) that it seemed unlikely that such degradation was feasible, the Competition Commission of the European Union, ordered MCI to divest of *all* its Internet business, including its retail business where it was never alleged that the merging companies had any monopoly power. MCI's Internet business was sold to Cable and Wireless, the MCI-WorldCom merger was finalized, and MCI-WorldCom is using its UUNET subsidiary to spearhead its way in the Internet.

accomplish this. AT&T has also announced, but not yet implemented, a wireless telepoint technology, similar to cellular mobile technology, but only suitable to immobile or slow-moving receivers.

The provision of telephony, Internet access, broadband, data, and two-way video services exclusively over cable lines in the “last mile” requires significant technical advances, significant conversion of the present cable networks, and an investment of at least \$5 billion (and some say \$30 billion) just for the conversion of the cable network to two way, switched services. Moreover, there is some inherent uncertainty in such a conversion, which has not been successful in the past. Thus, it is an expensive and uncertain proposition for AT&T, but, at the same time, it is one of the few remaining options of entry in the local exchange.

Meanwhile, Pacific Bell was acquired by SBC, and NYNEX by Bell Atlantic, despite antitrust objections, in an attempt of the RBOCs to maximize their foothold, looking forward to the time when they will be allowed to provide long distance service. Recently, SBC bought Southern New England Telephone (“SNET”) one of the few companies, which, as an independent (not part of AT&T at divestiture), was not bound by MFJ restrictions and has already entered into long distance.

In 1998, two significant mergers were announced and are presently being reviewed by antitrust and regulatory authorities. Bell Atlantic announced its intention to merge with GTE, and SBC has announced its intention to buy Ameritech. If all the local exchange carrier mergers pass antitrust and regulatory scrutiny, the 8 large local exchange carriers of 1984 (7 RBOCs and GTE) would be reduced to only 4: Bell Atlantic, Bell South, SBC, and US West. The smaller ones, Bell South and US West already feel the pressure, and

have been widely reported to be in merger/acquisition talks with a number of parties. Recently, BellSouth announced a pact with Qwest to sell Qwest's long distance service once BellSouth is allowed to sell long distance service.

Recently, the DOJ conditionally approved the SBC-Ameritech merger, and the FCC announced its own requirements to approve the merger. However, the GTE-Bell Atlantic merger may be much harder to approve since this merger may allow the combined entity to bypass existing rules. GTE is already providing long distance service since it was not part of AT&T and is not bound by the MFJ restrictions. On the other hand, the Telecommunications Act of 1996, amending the MFJ, prohibits Bell Atlantic from offering long distance service until a number of conditions are met and Bell Atlantic shows that its entry into long distance is in the public interest. I cannot see the Bell Atlantic – GTE merger clearing the DOJ unless GTE spins-off its long distance voice and data assets. If the Bell Atlantic-GTE merger is approved without such a condition, the combined entity can engage in a vertical price squeeze, cross subsidization and raising rivals costs – all the reasons that lead to the prohibitions of the MFJ and the 1996 Act.

6. The Coming World

The intent of the 1996 Act was to promote competition and the public interest. It will be a significant failure of the US political, legal, and regulatory systems if the interests of entrenched monopolists rather than the public interest as expressed by the US Congress dictate the future of the US telecommunications sector. The market structure in the telecommunications sector two years ahead will depend crucially on the resolution of the

LECs legal challenges to the 1996 Telecommunications Act and its final implementation.¹⁶

Already, we have seen significant vertical integration into the cable industry as AT&T found it extremely difficult to enter the local exchange market.

Whatever the outcomes of the legal battles, the existence of arbitrage and the intensification of competition necessitate cost-based pricing and will create tremendous pressure on traditional regulated prices that are not cost-based. Prices that are not based on cost will prove unsustainable. This includes access charges that LECs charge to IXCs, which have to become cost-based if the vision of a competitive network of interconnected networks is to be realized.

Computers are likely to play a bigger role as telephone appliances and in running intermediate size networks that will compete with LECs and intensify the arbitrage among IXCs. Computer-based telephone interfaces will become the norm. Firms that have significant market share in computer interfaces, such as Microsoft, may play a significant role in telephony.¹⁷ Hardware manufacturers, especially firms like Cisco, Intel, and 3Com, that make switches and local networks, will play a much more central role in telephony. Internet telephony (voice, data, and broadband) is expected to grow fast.

¹⁶ In one of the major challenges, GTE and a number of RBOCs appealed (among others) the FCC (1996) rules on pricing guidelines to the 8th Circuit. The plaintiffs won the appeal; the FCC appealed to the Supreme Court, which ruled on January 25, 1999. The plaintiffs claimed (among others) that (i) the FCC's rules on the definition of unbundled network elements were flawed; (ii) that the FCC "default prices" for leasing of UNEs were so low that they amounted to confiscation of ILEC property; and (iii) that FCC's "pick and choose" rule allowing a carrier to demand access to any individual interconnection, service, or network element arrangement on the same terms and conditions the LEC has given anyone else in an approved local competition entry agreement without having to accept the agreement's other provisions would deter the "voluntarily negotiated agreements." The Supreme Court ruled for the FCC in all these points, thereby eliminating a major challenge to the implementation of the Act.

¹⁷ Microsoft owns a share of WebTV and has made an investment in Qwest.

Finally, I expect that, slowly but steadily, telecommunications will drift away from the technical standards of signalling system seven (“SS7”) established by AT&T before its breakup. As different methods of transmission and switching take a foothold, and as new interfaces become available, wars over technical standards are very likely.¹⁸ This will further transform telecommunications from the traditional quiet landscape of regulated utilities to the mad dash world of software and computer manufacturing. This change will create significant business opportunities for entrants and impose significant challenges on traditional telecommunications carriers.

¹⁸ A significant failure of the FCC has been its absence in defining technical standards and promoting compatibility. Even when the FCC had a unique opportunity to define such standards in PCS telephony (since it could define the terms while it auctioned spectrum), it allowed a number of incompatible standards to co-exist for PCS service. This led directly to a weakening of competition and higher prices wireless PCS consumers have to pay to buy a new appliance to migrate across providers.

References

- Crandall, Robert W., (1991), *After the Breakup: U.S. Telecommunications in a More Competitive Era*. Brookings Institution, Washington, D.C., 1991.
- Economides, Nicholas, (1996), "The Economics of Networks," *International Journal of Industrial Organization*, vol. 14, no. 2, pp. 675-699.
- Economides, Nicholas, (1998), "The Incentive for Non-Price Discrimination by an Input Monopolist," *International Journal of Industrial Organization*, vol. 16 (March 1998), pp. 271-284.
- Economides, Nicholas, (1999), "The Telecommunications Act of 1996 and Its Impact," forthcoming, *Japan and the World Economy*, vol. 11, no. 3 (September 1999).
- Economides, Nicholas, Giuseppe Lopomo and Glenn Woroch, (1996), "Regulatory Pricing Policies to Neutralize Network Dominance," *Industrial and Corporate Change*, vol. 5, no. 4, pp. 1013-1028.
- Federal Communications Commission, (1995), "In the Matter of Motion of AT&T Corp. to be Reclassified as a Non-Dominant Carrier," CC Docket No. 95-427, Order, Adopted October 12, 1995.
- Federal Communications Commission, (1996), "First Report and Order," CC Docket N. 96-98, CC Docket No. 95-185, Adopted August 8, 1996.
- Hubbard, R. G. and W. H. Lehr, 1998, *Improving Local Exchange Competition: Regulatory Crossroads*, mimeo., February.
- Mitchell, Bridger, and Ingo Vogelsang, (1991), *Telecommunications Pricing: Theory and Practice*. Cambridge University Press.
- Noll, Roger G., and Bruce Owen, (1989), "The Anti-competitive Uses of Regulation: *United States v. AT&T*," in John E. Kwoka and Lawrence J. White, eds., *The Antitrust Revolution*. New York: Harper Collins, 1989, pp. 290-337.