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Telecom in the Time of Crash

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EXECUTIVE SUMMARY

Telecom in the Time of Crash is the story of how the global telecom industry evolved from a sleepy utility to a competitive wonder to a broken-down industry, suffering from overcapacity and unsustainable debt. It is told from the perspective of a management consultant, who has worked in the industry for thirty years, advising on new ventures and markets and on competitive strategy. Its purpose is to explain the forces that vaulted the telecom industry towards crash—and to project where the industry may be headed—from a historical viewpoint, benefiting in the process from some useful lessons.

The story begins with the breakup in 1984 of AT&T, despite the opposition of three Presidents (Ford, Carter and Reagan) under whom the issues of AT&T's size and dominance were considered. Unlike previous assessments, the author suggests that pressure from AT&T's Operating Companies—akin to the pressure from the Republics in the subsequent breakup of the Soviet Union—was a factor in the creation of a new decentralized telecom market first in the U.S. and then across the developed world.

Of course market competition was also driven by a new brand of policy makers, users (particularly corporate telecom managers), and activist suppliers (such as MCI, Nortel, Motorola and NEC) wishing to crack monopoly-based markets. In this context, competition was primarily a means to an end, the end being greater market share for particular suppliers and operators or lower prices and more product choices for users. This was clear in Europe and Asia where the introduction of competition and the promotion of influential local champions were often commingled.

The growth of telecom competition and decentralization away from traditional policy, technology and corporate centers (New York, London, Brussels, Geneva) reflected this emerging, dynamic worldwide industry. This was most evident in the mobile sector, and affected both service and equipment vendors. Another clear indicator of the success of "competition" was the rapid ascendancy of new entrants, such as Vodafone, Nokia, Hutchison and Cisco, who were able to challenge incumbents as well as prevailing theories that four or five entrenched companies would soon dominate the industry.

However, the traditional centers of the world's private telecom industry were not about to roll over and die. They reasserted control not through technology innovation or telecom policy but through the financial sector. New York's Wall Street and London's "City" formed an implicit partnership with a new generation of telecom CEOs, supporting their growth objectives and bonuses with ready financing (facilitated by low interest rates) and in some cases personal favors. This compact recognized and was fueled by the growing ubiquity of the industry. It would take the industry to a new winners-only, post-competitive level, buoyed by the infinite potential of fiber, wireless and the Internet.

During the next phase—the mid and late nineties—industry leaders with financial deal making and technology promotion skills supplanted predecessors with strong marketing, regulatory and operational skills, which were critical in establishing competition. Correspondingly, telecom regulators were finding their roles challenged, if not

supplanted, by Finance Ministries, on the one hand, and Wall Street (or City) analysts, on the other. The Finance Ministries sought to siphon funds from the sector through auctions, particularly of next-generation mobile spectrum (3G), while the analysts set the benchmarks (at times highly simplistic ones) that drove the growth companies of the late nineties to ever-higher stock valuations.

The telecom crash that began in March 2000 and continues to this day (September 2002) had several constituent parts— a dotcom crash (affecting telecom carriers and even more so technology vendors), a fiber crash (metropolitan, regional and intercontinental), and a 3G crash (stemming from the $100 billion+ committed for European licenses and spectrum). Suddenly, an industry that appeared capable of walking on water was fully submerged. With their New Economy focus on the dramatic growth of Internet data traffic, industry analysts overlooked the even more dramatic price and revenue declines due to capacity overbuilding. Altogether over $2 trillion of telecom stock market value has been lost, not counting the debt portion.

The crash resulted from the greedy behavior of the new entrepreneurs and CEOs that headed many of the sector's "growth stories." They sought ever larger company valuations, triggering ever larger compensation packages. This set the stage for the development of business models that were unrealistic and unsustainable. The models suffered from several generic weaknesses, including the underestimation of non-technology costs (construction, right-of-way and site access, etc.), overestimation of significant revenue streams, and grandiosity in the estimation of market shares.

Alternatively, in the 3G case, an industry/government coalition placed excessive—and, arguably, also greedy--demands on this new service. For example, the EU required all member governments to issue 3G licenses (typically five or six per country) within a short time frame, unlike the region's successful phasing of earlier mobile licenses. The subsequent high auctions fees reflected the over ambitious Pan European aspirations of the new-style telecom CEOs and their false view of 3G's prime time readiness.

So where is the industry headed now? Again there is talk of consolidation and the emergence of four or five dominant players, as there was at the beginning of the eighties and nineties. Yet so far distress financing specialists and recent entrants (such as Hutchison, which is acquiring Global Crossing, or IDT, which bought Winstar) are taking the initiative. Unless the sector goes into deep freeze for several more years, surprise-driven scenarios are more likely to prevail, whether the surprise consists of new technology, new entrants, or new marketing and operating practices.

The government role is also likely to change, becoming more supportive and, possibly, more interventionist. A clear lesson of the crash is that too many competitors were allowed into capital-intensive portions of the telecom market and were then allowed to proceed with too few checks and balances from their Boards, their advisors and auditors, and their bankers. The question that remains is whether the market has learned this lesson, in which case government intervention may be redundant and costly, or whether such intervention is a prerequisite of the market regaining its balance.

INTRODUCTION

During the last 20 years the world's telecom industry has gone from being a sleepy utility to a vibrant, then hypercompetitive marketplace to a bankruptcy-laden meltdown. According to industry sources, the sector has lost over $2 trillion of stock market value since early 2000, forcing telecom companies to stop pursuing aggressive growth strategies. For example, AT&T's technology spinoff, Lucent Technologies, came to be valued at nearly $250 billion within three years of its IPO in 1996, almost 50% higher than AT&T itself and almost fifteen times its value at the time of the IPO. Less than two years later Lucent had lost almost 90% of its value!

During this same recent period the telecom industry, national and international, laid off about one million workers. Meanwhile, the market was laying off companies, left and right, as Iridium, Winstar, PSINet, Global Crossing, Metromedia Fiber, McLeod and many others—all hot names of the late 1990s (and some with revenues exceeding a billion dollars a year)—declared bankruptcy. In July 2002 WorldCom, one of the largest telecom carriers, declared bankruptcy on the heels of a $3.8 billion accounting misstatement, the magnitude of which was amended upward to about $9 billion by late September (as this review was being completed). Former CEOs, CFOs and other executives of companies such as Global Crossing, Qwest and Tyco as well as WorldCom were being investigated (and in some cases indicted) by a slew of government entities, from Congress to the FBI. Overall, a very lean business climate replaced the boom years of the late nineties, along with growing industry scrutiny from the Securities and Exchange Commission and other regulators.

Outside the United States the buildup of aggressive new telecom companies took longer but the downfall came, if anything, sooner. Daini Denden in Japan, which entered the market in 1987, became an $8 billion behemoth by 1993 but by the year 2000 was suffering under a mountain of debt as Japan's economy experienced a decade of virtually no growth. In Europe competing local exchange carriers (CLECs, as they were referred to by both their financial backers and incumbent telephone companies) hit the wall in March 2000, as their stocks collapsed on the London, Frankfurt and Amsterdam exchanges, after several years of explosive growth—Viatel, Versatel, Jazztel, Colt and others were among the victims of this initial cyclone. And soon incumbent stalwarts from KPN in the Netherlands to British Telecom in Great Britain to Deutsche Telekom in Germany were also encountering financial quakes as credit agencies reduced their ratings and shareholders jumped to "safe" stocks in retailing, real estate and reinsurance.

Why did all this happen? Call it crash, call it hurricane, call it depression or meltdown. Why were the telecom companies and their backers so unprepared? Was it the end of the telecom era or merely an aggregate, multi-continent blip, disrupting Telecom's time cycle but not its ultimate upward trajectory (not to mention its insinuation in our business and personal lives)? Was it all due to the dot.com debacle or to the 3G auctions with their astronomical prices? And what would happen if and when the blip resumed its

upward course? Would things return to normal? And what is "normal" in a highly dynamic sector like Telecom—after crash?

To deal with these questions it makes sense, trust the author, to go back to the beginnings—not of time or even of telecommunications in the mid nineteenth century but of the modern phase of the industry, when privatization and liberalization and competition were all brought to a head—back to the breakup of AT&T, the big bang, the shock heard round the world that started it all.

1. A NEW WORLD VIEW

In the beginning—before 1980--the telecom world was bipolar. With very few exceptions, there was the United States, with its more than 3000 privately run telephone companies, dominated by AT&T, and there was the rest of the world—an enormous sea of government-owned and government-controlled operating entities. The latter were indistinguishable from the Ministries they were a part of, in some cases virtually indistinguishable from their countries' Post Offices (usually also a part of the same Ministries). In today's parlance the policy maker, the regulator and the regulated (the operating company) were all one and the same.

Pre-History: Governments as Operators

In most of the world telecom operators—invariably only one per country or per region—were so ensconced within their governments that they functioned like Treasuries, Labor Departments and Ministries of Industry. They collected money the way Treasuries collect taxes, although more often (quarterly or monthly). They created and filled jobs like Labor and Defense Departments. They promoted and supported national industry, as R&D centers and procurement agencies for mostly nationally produced—or, in the case of developing countries, nationally distributed (via local agents)—switching and transmission technology, telephone sets, cable encasing and attachment materials, telex machines, maintenance trucks and a slew of other technical and mechanical accoutrements. And they were educational institutes of technical training--and in the case of Japan even took on major savings bank functions.

By the way they also installed and operated telephone, telegraph, telex and other specialized telecommunications services. By 1980 this almost ancillary function of PTTs (Post, Telephone and Telegraph operators) managed to deliver telephone lines to almost all the households of some countries, such as Sweden, and to less than one in a thousand in many developing countries. All in all progress was made over decades and not weeks or months as we have come to expect it. There were no cellular phones, no cyberspace, few satellites (Sputnik 1 and 2 were launched in 1957 followed in 1965 by Early Bird, the first commercial satellite), no fiber or Internet Protocol. Automatic switches had still not been introduced in many parts of the world, so that if you called after 6:00 pm the call might not go through, if the manual switchers had gone home for the day.

Things were not enormously different in the U.S., although on most benchmarks of technical and service progress the U.S. was ahead of equally large other parts of the world. It was ahead of Western Europe as a whole though not of Sweden, France, Germany and the U.K. in some aspects. And like its PTT counterparts AT&T played more employment, social and educational functions than its private ownership would tend to suggest. Still there was an enormous difference in the ideology under which AT&T and its PTT counterparts operated, with significant practical consequences. AT&T had about a million employees in 1980, reflecting its union-monitored, quasi-social role, but it also had close to 3 million shareholders, a rising and falling stock price, and some competitors (even if only at its margins). All in all, the two worlds were different, as different as Byzantium and Rome, Berlin and Bombay, New York and Geneva.

New York and Geneva as Bipolar Capitals

New York is where the world's largest telecom company was headquartered in the late 1970s. Having dominated the U.S. market for sixty years, AT&T far exceeded any other operator—in the U.S. or abroad--in number of "lines" served, number of employees, number of shareholders (with GTE in second place), or most other economic and technical statistics. New York (including nearby New Jersey) was the technological, financial, corporate, and operational capital of the telecom industry in the U.S. and in many respects worldwide. Although only a few countries harbored private telephone companies, except for Finland and Hong Kong the private operators were usually small, lonely exceptions, such as in Brazil, surrounded by governmental telcos and their anti-capitalist—or at least a-capitalist--ideas. Still the PTT world followed what AT&T was doing, partly out of curiosity about the exotic American giant and partly because sooner or later they might adopt the company's practices and innovations at home.

Yet for comfort, and self-defense the PTTs worshipped at another holy place—Geneva. Geneva was a very different kind of town. It was not a corporate or financial or technological hub. Based in the French-speaking corner of Switzerland, Geneva was nonetheless the symbolic and diplomatic capital of the international telecom industry. As the home of the International Telecommunications Forum, established in 1865, it functioned officially as a United Nations forum. Unofficially Geneva hosted an intergovernmental club, whose primary function was keeping order in the telecom world. Order meant not too much change. Major decision-setting events, such as the World Administrative Radio Council, were held every ten years or more. (Even now, a more commercialized ITU holds its main trade show once every four years, though regional shows and conferences are held more often.).

The United States could exert a lot of influence at the ITU, when there were official opportunities to do so but was kept in check by the coalition-building capabilities and alcohol-consuming prowess--exhibited at the innumerable, mandatory cocktail receptions--of the European and other states. It is not that Americans were not capable of holding their own as drinkers. It was the need to keep drinking while conversing in

implicit diplomatic terms and building intricate coalitions that posed the challenge. The French, meanwhile (along with other some other Europeans), were reputedly experts at the game. Their coalitions with diplomatic and trading partners, former colonies, Soviet Bloc members, Arab States, and outright quid pro quo recipients were remarkable even by U.N. standards. Unless the U.S. worked very hard, typically in conjunction with the British and Japanese, decisions went another way or were simply postponed another decade.

So what brought us from this homeostatic state of affairs to the present, with the ITU competing with private trade show companies and periodically pondering how to streamline its decision processes—and with most of the world espousing a common philosophy of privatization, liberalization and competition? In international terms the answer to this question goes back to the breakup of AT&T. Why after all would the U.S. break its largest company into pieces? And how would New York end up beating Geneva by doing so? Or did New York really beat Geneva? And has the bipolar world of the early eighties (and before) really turned into a unipolar world?

Washington's Big Bang: The Breakup of AT&T

The static world of telecommunications came to an end in 1982. It did so as Washington decided to challenge New York (and indirectly Geneva)—to shake up AT&T's monopoly. In that year the Justice Department and AT&T agreed to an antitrust settlement that called for AT&T's breakup—as of January 1, 1984--into eight pieces. Seven of the pieces would be local telephone operating companies (later named Ameritech, Bell Atlantic, BellSouth, Nynex, Pacific Telesis, SBC, and US West). The eighth piece would retain the name AT&T as well as the long distance and manufacturing operations, including Bell Laboratories.

No other single decision (with the possible exception, as I will argue below, of the British government's decision to auction next-generation mobile licenses in the spring of 2000) has had such an impact on the course of the telecom industry. This was, after all, no temporary partitioning like that of Germany into four zones after World War II. It was up there with the partitioning of Standard Oil, maybe even of India into two and later three countries—and, subsequently, of the Soviet Union into fourteen.

It goes without saying that a decision of this magnitude was not made overnight. The antitrust suit was first brought in late1974 under President Ford. It was pursued during the Carter Administration. And settlement was reached during the Reagan presidency. Reagan, as far as can be known, was against the suit, as was Ford and probably Carter. So were Reagan's Secretaries of Defense, Agriculture and Commerce and Attorney General. As the largest employer and a high-tech leader, AT&T was heavily embedded in the political, commercial, social and military structure of America.

Still AT&T lost the antitrust battle and, with today's hindsight, arguably the whole telecom war. It lost to a fourth-level government official (William Baxter, head of the

Antitrust Division) and an informal coalition that included MCI, the FCC, Judge Harold Greene, most foreign and domestic equipment suppliers, the telecom managers of some large corporations, and a few disgruntled academics. Mostly, these were second-tier political players, although over time some of the beneficiaries of the settlement (MCI, Nortel, Motorola, most notably) would come to challenge AT&T's market position. Many senior managers of AT&T's operating companies, which had been kept on a tight leash, also benefited from the settlement, although their thirst for greater autonomy–like that of the federated Republics of the Soviet Union a few years later--was not publicly discussed at the time.

In the end AT&T convinced itself (and many of its shareholders) that it too was a beneficiary. In part this was because it was able to a large degree to dictate the structure of the settlement. Instead of separating the manufacturing part of AT&T from the service part (an approach that a few analysts, including myself, recommended), AT&T preferred to spin off what it considered would be seven relatively weak operating groups. Ironically on this point it had the full concurrence of MCI, which wanted to sever the long distance connection between AT&T and its "babies". (AT&T also thought it was a coup that the settlement allowed it to enter the computer industry, from which it had been barred by a previous settlement.)

Arguably two or three integrated (providing local and long distance service) Bell operators would have been better equipped to take on the challenge of international telecom competition, a challenge and opportunity which, as we will see below, the Baby Bells largely failed to meet. But at home the Baby Bells turned out to be much stronger than AT&T or most pundits and analysts foresaw at the time of the breakup. (As luck would have it, the author was one of very few analysts to take the opposite view, as reflected in a letter published in Barron's in 1984.) In any case, implemented in 1984, the Breakup of AT&T dramatically altered the U.S. telecom landscape and ignited a chain of domestic and international reactions that continue to this day. It looked as if the New York-based dominance of the industry was to be dispersed across the U.S., across the Atlantic to the U.K., and eventually across the globe.

2. EXTENDING COMPETITION

The ten years after 1984 were a period of dramatic telecom market development in the U.S., as new competitors and new technologies entered the fray. It was also the decade during which the rest of the developed world (and much of the developing) accepted the ideology of telecommunications competition. At first the process was not inevitable at all. The "Geneva" club held together, with the European members, apart from the British, questioning the relevance of competition and of privatization to their national settings. What might be good for the cowboy was not necessarily good for the bureaucrat or for the bourgeoisie.

Still first the British, then the Swedes, then the Dutch and the European Commission, and eventually the Germans, the French and the Italians bought into the new model of the telecom industry. If the U.S. were willing to destroy its telecom giant, AT&T, perhaps the rest of the world (the developed world, at least) would have a chance in the new competitive world order of telecommunications.

European Responses: London, Paris and Brussels

Posing as Washington's revolutionary accomplice, the British government sought both to adopt and to tame the competition tiger being unleashed across the Atlantic. It did so by finding essentially a third path that was neither competition nor monopoly. The government was already concerned that Cable & Wireless, a unique U.K.-based private operator, which operated all over the world but not in the U.K., would not survive without some changes.

C&W generally served as the minority (thought usually operationally-controlling) partner to various small governments, from Jamaica to Bahrain. Its "crown jewel" telecom operation, however, was in Hong Kong, where it was the dominant owner and from where it derived most of its profits. Sooner or later Hong Kong would fall to either the American philosophy of competition or to the Chinese—or, as it turned out, to both. This was "of some"—understated, in the true English manner—"concern" to the government in London.

C&W's history, as its political ties, went all the way back to mid nineteenth century, at which point its predecessor company had launched the first transatlantic telegraph cable. All those years C&W was kept from directly serving customers in the U.K. by the Post Office's monopoly over domestic telecommunications. Yet all this ended in the early 1980s with Thatcher government decisions to corporatise the telecom portion of the Post Office (British Telecom) and to allow a C&W subsidiary (Mercury) to offer competing service in the U.K.; and its subsequent decision to privatize BT by giving up its majority ownership in 1984. This was all done under the banner of competition—and certainly some competition was instigated, particularly in London's financial district, the City—but it would take another decade before American or other telecom operators would be allowed to enter the U.K. fixed market.

Meanwhile, Oftel, the regulator, and its consultants (with multi-megabyte financial models, whose intricacies often remained as mysterious as the Dead Sea Scrolls) spent a decade fine-tuning British Telecom's permissible service tariffs. These models and associated consulting services would become a significant export item during the nineties, first to newly formed regulatory bodies in western Europe, then to eastern Europe, and eventually to governments around the world. (They were often followed by London-based financial advisory services and in some cases U.K. technology suppliers or operating partners.)

The other relatively early British contribution to telecom liberalization was on the mobile side. In the mid 1980s the duopoly formula, already established in the U.S., resulted in the licensing of two operators, a BT-affiliate and Vodafone, with the latter exceeding BT's Cellnet subscriber base within two years of startup (and going on to become the world's largest mobile operator). But more innovative from a regulatory standpoint was the licensing of three [??] additional mobile operators before the end of the decade, which at the time was a first anywhere, including the U.S. Out of this decision came not only another regulatory concept (with associated mega models, advisory services and so on) that could be exported to the world but another multinational mobile operator, Orange, whose selling and buying by Hutchison, Mannesmann, Vodafone and France Telecom would occupy a good part of the City's investment banking talent during the late 1990s.

If London was competition's loudest cheering section outside the U.S., Paris was where the loudest boos emanated. They came in the form of dismissive French phrases, such as "ce n'est pas serieux," voiced with full exasperation concerning "les Americains" in the corridors of multinational forums (and undoubtedly more explicitly in less mixed company). Many others felt the same as the French but, respecting American power and freedom of expression, limited their protests to fine technical points about the difficulties of implementing competition without special transitional considerations. (They could even be complimentary—"oh, yes, competition is what we really need"—knowing full well that the French would veto the idea.) Meanwhile, Paris instinctively understood, as few others would until 2002, that unbridled competition could run havoc with the finely calibrated investment plans of a centrally-directed PTT. If Geneva was the diplomatic capital of the old PTT club, Paris soon became its strongest adherent and operational fulcrum.

The battle between the old club and the new insurgents went on through the eighties and in some respects well into the nineties. Yet by the late eighties a forum for reaching some compromise was found. The forum was Brussels. Considered by the French an extension of Paris, by the Germans as just across the border and by the Dutch as a Flemish outpost, Brussels was also an American city with its numerous multinationals, its NATO headquarters, and its relaxed lifestyle. Within the context of the "single market" concept, the European Commission soon accepted competition and open markets as telecom theology, while launching a new digital mobile standard (GSM) to help its industry to compete with Japan and the U.S. This was the essence of a compromise that even Paris could accede to: more competition, larger market, more technology development, more sales, more jobs, more government tax revenues.

A decade later Europe's infrastructure giants and the Commission hatched a plan for the next generation (3G) of mobile technology and multimedia services. As we will see below, this plan's implementation began with a bang and ended with a whimper.

Baby Bells in the Time of Devolution

The breakup of AT&T emphasized the differences between the privately dominated telecom sector in the U.S. (subject to antitrust rules but not to government management) and its government-operated counterparts in most of the world. At the same time, there were large similarities between these two telecom worlds. Like the PTTs AT&T up to and during most of the 1980s was a monopoly wherever it operated and it faced relatively little competition—only in specialized areas like international telegram and telex services and then in long distance services.

When in the late 1980s the author posed a particular question to AT&T's CEO and a few days later asked the same question of a manager about twelve layers lower in what was then an 18-layer management structure, he received the *exact* same answer, word for word**.** The problem—whether it was AT&T, the British Post Office or DGT (as France Telecom was referred to in its pre-corporatized days)—was no slack in the system. A field manager could not interpret a central operating policy in the light of local circumstances, an operating unit could not decide to try a new service, even a top executive could not do very much to change how AT&T or BPO or DGT behaved.

In the U.S. this began to change after the breakup. The AT&T or New York view of the industry no longer prevailed. Instead, the Regional Bells constituted their own "capitals" in Atlanta (BellSouth), Chicago (Ameritech), Denver (US West), Philadelphia (Bell Atlantic), San Francisco (Pacific Telesis) and St. Louis (Southwestern Bell). Soon the Bells were competing with each other domestically, encroaching increasingly into each others' territories, and were establishing independent "foreign policies" as they launched international ventures across five continents.

The Baby Bells made mistakes during this early phase (for example, moving into real estate and computer retailing) and, despite their growing wariness of each other, they often behaved as a herd. Still they created a market where before there had been an AT&T command economy. More vendors (Northern Telecom, NEC, Motorola, and others) could flourish alongside AT&T Technologies (which later became Lucent), and more services were deployed more rapidly than before. (The most notable example is cellular mobile, which AT&T kept in its labs for two decades, never taking it seriously, while the Baby Bells deployed it very rapidly as market demand became apparent.)

Internationally, the Baby Bells were soon involved in ventures as far away from Philadelphia as New Zealand, as distant from St. Louis as Israel. Some of the Bells focused their efforts on certain business segments (such as cellular service and Yellow Pages directories). US West, on the other hand, placed no geographical or segment limits on the ventures it would consider. Its business development executives circled the globe virtually non-stop, checking out deals in Bangkok, Jakarta, New Delhi, Rome, Zurich or Rio on the way. BellSouth for a while focused almost exclusively on China, shuttling as many as a thousand guests to parties and receptions to cement good business relations.

Projects were discussed. Possibilities were toasted. But after five years BellSouth had only a single "smart building" in Shanghai to point to. By the late 1990s all the Baby Bells were retrenching from their foreign escapades to concentrate on domestic competition from CLECs, cable companies, the long distance operators (including AT&T) and each other

Devolution was also occurring on the technology side. With a rapidly expanding U.S. competitive market, Silicon Valley turned on its telecom spigots, Boston aimed to hold its own, while Nortel and other Canadian suppliers set up and enlarged manufacturing and R&D operations in Memphis, Dallas, the Research Triangle and elsewhere. The West Coast and Boston were pioneers of ARPANet, predecessor to the Internet, while New York was a relative latecomer to packet communications and IP technology. In the 1990s Silicon Valley also took the lead in router technology, with Cisco and Nortel surpassing AT&T's technology spinoff (Lucent) in market valuation and, increasingly, in market share.

By the late eighties and the nineties relatively dispersed centers played leading roles in the deployment of innovative technology, applications and services in Europe as well. Although the Internet and mobile data would soon be the rage at industry shows, the money for carriers was in mobile voice, whether traditional (Stockholm, Tel Aviv) or prepaid (Rome). Nokia (Helsinki), Ericsson (Stockholm) and Motorola (Chicago) became the world's leading mobile technology vendors. However, in several of the countries harboring these centers fights broke out between the finance ministries and the telecom regulators over whether to auction licenses for the next generation (3G) of mobile services and how to spend the money. Meanwhile, cellular achieved a higher "penetration rate" among teenagers in the Nordic countries than among affluent adults almost anywhere else. Was this due to the cold climate, the public transit system or boring schools? No one was sure.

A Tale of Two Asian Cities – Tokyo and Hong Kong

The interest in harnessing American-endorsed telecom competition to local ends was even greater in Asia than in Europe. Japan, the largest Asian economy and the greatest threat to both U.S. and European leadership in telecommunications, played a sleek game of diplomatic poker. Outwardly the country acted as if it would resist all attempts to introduce competition to its telecom market. Inwardly it was preparing its industry to benefit from the growth-enhancing effects of a competitive marketplace.

This did not mean that the transition to competition was hurdle-free, as the author (who visited Tokyo regularly during the 1980s) remembers. Riding on the crest of Japan's thirty-year economic expansion, three government ministries (Ministry of Post and Telecommunications, Ministry of International Trade and Investment or MITI, and Ministry of Finance) fought over how to respond to American —and Japanese industry-- pressure to open the market. In the end Japan decided not to break up NTT but to focus on letting new players into the growth-driving telecom sector. The Telecom and Finance

Ministries had pulled a fast one on MITI, which representing Japan's telecom vendors had hoped to reduce NTT's buying power with a breakup.

In September of 1987 on a cloudy day, competition in long distance service began in Tokyo. Japan Telecom, Teleway and Daini Denden started offering private lines to corporate users and alternative facilities to the general public. Through these three new carriers and several hundred "enhanced" service providers (without their own transmission facilities), many sectors of the traditional Japanese economy were able to enter the telecom growth sector, with most of the new carriers typically owned by a consortium of other firms. Railroads, automobile manufacturers, trading companies, steel producers, electronics firms, insurance providers and many others were now also telecom players.

While NTT lost market share, it rapidly ballooned into the world's most valuable telecom company; while its smallest—but ultimately most successful new competitor--Daini Denden (DDI), exceeded a billion dollars in revenues within six years of commercial startup. DDI had less prestigious ownership ties to Japan's leading traditional economic groups than did Japan Telecom (Japan Railroad-affiliated) or Teleway (Highway Authority- and Toyota-affiliated) but it was nimble and creative, something your author stressed to Japanese industry analysts who invariably saw Japan Telecom and Teleway as superior contenders. Without access to right-of-way DDI could not lay fiber cables and had to rely on second-rate microwave technology. But it turned this weakness into an asset by rolling out its national network faster than the other newcomers could. It also offered subscribers a clever least-cost routing service, promising to send calls on its competitors' lines when and where these were cheaper than DDI's (rarely the case).

This pattern of local emergence of new telecom players was evident in Hong Kong as well. Only there the dominant operator, Hong Kong Telecom, was not locally owned to begin with. Would this result in a more open market from a foreign entry standpoint? Not to bet on it. At first several local Chinese "hongs" emerged as challengers to expat-dominated and largely C&W-owned Hong Kong Telecom, even as civil servants adopted open competition as a regulatory lodestone. The most clever and visionary of these was Hutchison Telecom, which as the territory's third mobile operator soon beat the two incumbents (including Hong Kong Telecom) by selling mobile phones to customers without cars, a radical concept when Hutchison first introduced it in the mid 1980s.

By the late 1980s U.S. and European operators were falling over each other to enter Hong Kong, seeing it as a gateway to the huge Chinese market. Motorola, Hutchison's mobile partner, and AT&T, as shareholder in SmarTone (another mobile operator), were two of the relative success stories. But many others—Bell Canada, BellSouth, TeleDanmark, US West, Vodafone, among them--failed to gain entry or did so on the backs of incompatible or weak local partners and usually withdrew from the market after two or three years. When Hong Kong was handed back to China in 1997 few foreign operators maintained a strong presence in what was now a Special Administrative Region (SAR) of the most populous country and one of the most rapidly growing economies in the world.

In the end Hong Kong authorities decided to prepare for the Chinese handover (not to mention for their ongoing competition with Singapore), by allowing the Li family to take over most of the telecom sector even while licensing more and more newcomers to provide mobile, fixed and video services. Li Ka-shing, the father, controlled Hutchison Whampoa and, thereby, Hutchison Telecom (from its founding in the mid 1980s), while his second son, Richard Li, would end up controlling Hong Kong Telecom within four years of the handover.

Besides being the largest mobile operator (in subscriber terms) in Hong Kong, Hutchison developed a global portfolio of mobile holdings that in 2000 stretched to the U.K. (Orange), the U.S. (a share of Western Wireless and VoiceStream), India and many other countries. Hong Kong Telecom, meanwhile, remained the most profitable mobile operator in Hong Kong, even as it continued to lose market share to other fixed and mobile operators. It also attempted during the late 1990s to gain control of Hong Kong's cable TV market by launching a Video-on-Demand service. Demand for the service exceeded expectations but it was eventually terminated due to heavy programming and fiber installation costs.

By 2001 the British (through C & W's control of Hong Kong's dominant telecom operator) were gone from their former territory's telecom sector. The Li family, originally from Shanghai, now dominated the sector. Yet China—at least for the time being—refused to let the Li's or other Hong Kong-based companies to own "mainland" telecom operators, treating them as foreign entities and not as part of China in this respect.

Return of the Triumvirate – London, New York and Tokyo

Back in London the City's investment banks and nearby management consulting firms (in both cases, many of U.S. origin) took on the mantle of selling telecom privatization and competition to governments in western Europe, eastern Europe, Asia, the Middle East and Africa during the late 1980s. The U.K. model was more palatable to many international authorities than the "sink or swim" American one. By the 1990s London was also selling auctions, culminating in the 3G auction of April and May 2000, which raised over $34 billion but ended up triggering a backlash from the financial community. Growing belief in new mobile data and multimedia uses—from location-related information to downloading video clips on the go to micropayment by cellphone—hit a hard wall sometime in early 2001

Not to be outdone New York continued to control the biggest financial transactions in the sector, directly or through its U.K. and Asian subsidiaries. The original telecom "capital" had gotten over AT&T's decline and had adjusted to a polycentric industry, both domestic and international. With the blossoming of the dotcom economy and associated vendors (large and small), New York virtually resumed its primacy in a sector that exuded technological innovation but was really financially driven. Competition among

telecom firms began to pale next to the competition among investment banks to arrange the financings

Then with the collapse of the Internet and telecom sectors in 2000 and 2001, Tokyo suddenly re- emerged as a world leader. NTT's and DDI's joint ascendancies had been curbed in the early 1990s by the deflation and recession of the Japanese economy. But as if out of nowhere NTT DoCoMo's i-mode technology managed to attract 30 million subscribers to its mobile Internet-type service within 30 months of launch. With the hype of next-generation wireless technology (3G) beginning to waver in Europe and the PDA growth curve tapering off in the U.S., i-mode made Tokyo hot once more. The telecom world was captivated by i-mode even while misconceiving many of the details (for example, that most of the users are teenagers, which is not the case by far).

Vodafone, the world's largest mobile operator (in subscriber terms) bought into one of DoCoMo's Japanese competitors (J-Phone), thinking perhaps that this was the best way to prepare for head-on competition with DoCoMo. This was after Daini Denden (DDI) merged with Japan's main international carrier, KDD, creating a vertically integrated operator ("KDDI") that provides international, long distance and mobile services—and incurring considerable debt in the process. This was also after DoCoMo had made investments in several mobile operators in Europe, North America and Asia, as a first step towards the global rollout of its i-mode technology. While Japanese infrastructure and handset suppliers had largely played a secondary role in the digital cellular market (including GSM), they were now being given a second chance with i-mode. They were also targeting the 3G market, which was based on CDMA technology rather than the more familiar TDMA.

Since 2000 more and more questions have been raised about Tokyo and Japan's future role in the market, particularly after the success of i-mode and more recently after KDDI chose a different 3G technology standard than DoCoMo had (cdma2000 vs. W-CDMA). (The choice so far appears to have been a wise one as more "3G" subscribers are flocking to KDDI than to DoCoMo. It may also serve to introduce U.S. and Korean suppliers into Japan.) The questions remain. Will Tokyo be the first major telecom battlefield of the twenty-first century, testing the armaments of revived local as well as foreign suppliers? Are the business and technology models of Japan transferable to other parts of the world? Will i-mode survive the onslaught of 3G?

3. WINNERS AND LOSERS

During both the 1980s and the 1990s many industry pundits—and not a few insiders as well—thought the telecom sector was going to be taken over by four or five behemoths. In both cases but especially the 1980s, the U.S. market was considered core to mastering the telecom universe with an occasional bow to "globalization," although this was not a heavily used term until well into the nineties.

The tendency to foresee industry consolidation down to a handful of mega players undoubtedly reflected a yin and yang sense of the limits of competition. Just as the old model of monopoly ceased being espoused (at least in public), the advantages of size and scale started to be emphasized. Procurement advantages. R&D advantages. Marketing advantages. Financial advantages. The industry had no more room for Davids, only for Goliaths, if you believed the pundits.

Threat of the Office Technology Vendors

The Goliaths of the 1980s were going to be office technology companies integrating forward into telecom services. For example, the author remembers being told in 1980 to focus on five specific giants—AT&T (the dominant incumbent), Exxon (which was investing in a bevy of office products companies at the time), IBM (widely considered AT&T's biggest emerging challenger), ITT (with widespread international telecom manufacturing and service holdings), and Xerox (which was developing a stealth wireless telecom venture)—as the winners of the next decade by a recently acquired client. The client, one of the five, feared that these large players would leverage their manufacturing bases to sell both products and services into an increasingly competitive telecom market. (Other such diversifiers during the 1980s included Citicorp, Federal Express, General Electric, GM, Kodak, McDonnell Douglas and Wang.)

Yet the winners of the 1980s were a different set of players. They were companies such as MCI and Northern Telecom (now Nortel) and NEC and Cable & Wireless and Motorola. Overall, these were more telecom-focused players than the ones that preoccupied our client. They were not generally as big as the expected mega winners; MCI was a mere startup. And many had non-U.S. bases. In fact, leveraging domestic monopoly positions in their core market, whether Canada, Hong Kong or Japan, as a base for entering non-monopoly markets such as the U.S. and U.K. underlay the success of the actual winners.

Northern Telecom sold telephone equipment into the U.S. from its monopoly base in Canada (disproving along with Ericsson—and later Nokia—Michael Porter's adage that companies needed competitive domestic markets to be successful international competitors). NEC, meanwhile, sold equipment into many international markets from its equipment oligopoly (with Fujitsu, Hitachi and Oki Electric) in Japan. And Cable & Wireless competed with British Telecom in the U.K. through its Mercury subsidiary, also leveraging its position as the sole telephone company in many countries and islands around the world, including Hong Kong (its "cash cow" and largest market).

Staying Global and Focused Or Local and Growing

The "winners" of the next decade—the nineties--turned out to be even more international in character and in some cases were newcomers to the telecom sector. They included companies such as Hutchison, Vodafone, Cisco, Nokia, Nortel again, Telefonica, and SBC (formerly Southwestern Bell, which had acquired Ameritech, Pacific Telesis and Southern New England Telephone during the course of the decade) and Verizon (the amalgamation of Bell Atlantic, GTE, Nynex and AirTouch). Again, the pundits along with most industry insiders were wrong. They had predicted at the beginning of the decade that four or five mega-operators would soon control the industry. The names mentioned most often were AT&T, British Telecom, Germany's Deutsche Telekom, Japan's NTT, and MCI, all of which were less well off at the end of the decade than at the beginning or, as in the case of MCI (which had been absorbed into Worldcom), were no longer independent..

By 2001 AT&T and BT were literally falling apart, the core companies a fraction of their former selves. Deutsche Telekom, like other European operators, was laden with debt and facing numerous competitors in its home market. NTT, meanwhile, which in the late eighties was worth more than the next 20 largest telecom companies combined (in stock value terms) was worth only slightly more than the next highest telecom firm (Nokia or Lucent, depending on the day) by the end of the nineties after a decade of competition and economic recession. This is not counting the fact that it was worth *less* than its partly-separated (a key factor, in my view) subsidiary, NTT DoCoMo. (Similarly Telecom Italia Mobile, TIM, would soon come to be worth more than its parent, Telecom Italia, and Vodafone would soon outpace NTT, all reflecting the ascendancy of the mobile operators.)

Also, with the exception of DoCoMo and (arguably) Verizon, the winners of the nineties did not come from the traditional telecom centers, showing that focus, flexibility and export-mindedness had become more important than initial size and location. The winners came largely from regional capitals and local centers—Hong Kong, Silicon Valley, Helsinki, Seattle, Madrid and San Antonio. Even Vodafone, which in several respects emerged as the overall industry leader, could not be identified with a major capital. (London's financial center, the City, is about 55 miles east of Newbury, the small, inconspicuous city where Vodafone has been headquartered.)

The route to success for a traditional operator was essentially agglomeration and holding on to its mobile subsidiaries. Bell Atlantic had almost lost its way when it pursued a convergence path and tried to buy TCI, the largest U.S. cable operator (which AT&T later bought, thereby losing its way). Bell Atlantic got back on track by merging with GTE and simply aggregating its base of local lines as well as mobile operations, something SBC had just learned to do. Meanwhile in Japan, NTT did not retain full ownership of its highly successful DoCoMo subsidiary nor did it manage to merge with--or acquire—any nearby local operators, as they were (and remain) government owned.

While in Europe Deutsche Telekom and France Telecom managed to accomplish some lateral expansion (mostly eastward) and some mobile expansion (particularly FT's acquisition of Orange) but were less astute—or less lucky--than their American counterparts in controlling their debt, particularly as they ran into humongous 3G auction payments.

Visionary Technology vs. Telecom Wal-Marts

On the technology side, the key to success during the nineties was largely based on product focus, a commitment to advanced (though not "bleeding edge") technology, and geographical expansion. "Product focus" at the scale of a Nokia, Nortel or Cisco did not mean single mindedness but it did mean knowing that most of the sales growth lay in two or three primary areas and not in playing telecom department store to the world, as Alcatel, Lucent and Siemens tried to do until fairly late in the decade.

Clearly, the mobile sector was critical to Nokia's focus (a company that had been in logging, rubber products, computers and TVs) as was the dotcom focus to Cisco. Nortel tried and largely managed to straddle both of these rapidly growing worlds by emphasizing a shared digital vision. Geographically, Nokia (coming from the smallest country, Finland) made the greatest strides in globalizing its presence but large shares of Cisco's and Nortel's sales were from outside their home region (North America) by the late nineties as well. In the end corporate vision, culture and provisioning capabilities also played a critical success role, as some of the non-winners may have had more technical, financial and management resources (not to mention better golf playing skills) but not necessarily the focused vision at the top nor the day-to-day provisioning flexibility and customer service culture at the bottom.

Nokia broke ranks with its two co-leaders, Cisco and Nortel, in one key respect. It grew largely internally during the nineties and not through acquisitions. In part this was because it had tried going the acquisition route in the late eighties, buying computer and TV business it later regretted having acquired. Nokia's greatest growth barrier had been the number of young managers that Finland's few universities could produce. (Each year the author visited Nokia in Helsinki during the eighties he found its managers a year younger on the average, heading towards the early twenties.) In the end Nokia decided it could absorb management recruits from other cultures more easily than entire companies, which invariably would also come from outside Finland. And despite rumors of its merger with Ericsson in next-door Sweden in 2000, Nokia has stayed clear of the major acquisition route in recent years.

One can only speculate about the fate of a Nokia-Ericsson merger, whispers of which resurface from time to time. Ericsson has proved to be neither as visionary as Nokia nor as much of a telecom supermarket as Alcatel or Siemens. Its focus has been on telecom infrastructure, with a secondary business (which it has recently partly shed) in mobile handsets and other terminals. Ericsson's cultural center of gravity has been in the fixed telecom market, a tradition that went back to its late nineteenth century days as telephone

operator in St. Petersburg, Russia, while market growth, what is left of it is on the mobile side. (Interestingly, Ericsson is rekindling its service tradition—not by becoming a licensed operator, which would amount to competing with its customers, but by managing customers' networks, including mobile ones, on an outsource basis.)

On the surface, at least, Ericsson has a more aggressive and assertive culture than does Nokia. This all goes back, in the author's mind, to how Swedes and Finns cover ice hockey games on television, based on a study he read some 35 years ago. The Swedish TV directors of the time followed the puck, providing relatively microscopic, zoom-like coverage. Their Finnish counterparts took a macroscopic, wide-angle view, featuring the interaction among the players. Nokia is forward-looking but tactically it is a lateral vision player. Ericsson looks straight ahead—at the puck—with great mission dedication but may sometimes not notice quickly that the game has changed.

Meanwhile, Cisco and Nortel surfed through the latter half of the nineties on the backs of one acquisition after another. Cisco developed the model, Nortel adopted it, and soon a whole cadre of technology startups were imitating this growth by acquisition strategy by either buying other startups or by being bought. The approach was in the end quite simple—pay a lot (a few billion, if at all possible) for a company with a good technology idea, some bright people, and maybe a customer or two (or, in the latter years, just a beta site or two), pay for it using mainly stock not cash, watch your own stock value rise by more than you paid out (this is the magical, New Economy part), pay large bonuses to your new and old managers in the form of stock options, and then buy another company. What relationship does this have to the basic business, a post-nineties, chastened reader asks? Curiously, it had quite a good relationship. All the acts of folly generated enormous amounts of free publicity at a time when well-publicized growth ruled the roost. It bred awareness, interest, inquiry and actual sales. Every one wanted to be associated with a winner. It lasted several years.

Of course the interaction between technology companies and operators is another important dimension of the global competition game. Every time two significant operators merge the technology companies cringe (unless they are convinced they have special access to the new combo) over the loss of a potential or actual customer. At a minimum it will take a year or more to determine if company X's centralized procurement system will be imposed on Y's decentralized one. Or will some mix evolve, requiring successful sellers to market both to the center and to the field—and, possibly, to some intermediate regional level as well. Similarly, every time two major technology companies merge (as Alcatel and Lucent as well as Nokia and Ericsson threatened to do in 2001), the operators worry about their loss of leverage, not to mention product choice, the theoretical promise of lower prices due to scale notwithstanding.

New Operators Sail the Alphabet Seas

As for new telecom operators, in the end the nineties were more unkind to them than the eighties had been even though they encouraged more of them to raise their sails—in the

short-lived winds of easy financing—than ever before. Whether in the U.S., in Europe, in South America or Asia, the carrier and service operator startups tended to hoist their spinnakers even before securing the main sails, as they set out into the alphabet seas of CLECs, DLECs, GMPCSs, and ISPs. Other than the cellular operators, most of them were capsized by the hurricanes of 2000 and 2001. They reached this unhappy state by forgetting the basics, thinking the New Economy was a strong tailwind even after it turned into a furious headwind and then hurricane. How many times they needed to change and adapt their business models during the course of the second half of the decade should have been a warning; instead it was taken as a sign of the dynamism of the new age. Virtually this, virtually that, virtually anything that would keep the financing flowing.

Iridium should have been a warning. It wanted to introduce a new technology into a new market using a new form of organization. Triple risk on the best of days, even out in the middle of a desert where the signal was unobstructed. The expected market was an amalgamation of business travelers, remote mining and construction workers, and local mobile users out of the range of cellular towers. Too many motivations and too little control held the unique corporate structure together—or failed to. Motorola was in Iridium in part to keep its advanced technology engineers from jumping ship to another leading edge project. The regional partners (about a dozen of them from Japan, Italy, different parts of South America, the Middle East and elsewhere) were in it for the ride, often hoping that the others would show the way to profitability. The central organization (in which no single partner held more than an 18% share) wanted to have global rates, even if they were going to be very high ($3.00 per minute and up), while the regions contended this would be impossible, given different local cost structures, interconnection tariffs, taxes and custom duties for the brick-like handsets, not to mention currency fluctuations. Getting the constellation of 67 interweaving low-orbit satellites up and working was less difficult than extracting harmony from the unwieldy shareholder consortium.

But Iridium was dismissed as quixotic, too late to market (once cellular was available in so many populated areas of the world), too expensive. In retrospect, Iridium was the tip of the iceberg. Its bankruptcy in 2000 was the first dose of cold reality hitting the telecom alphabet seas. It should have been seen as a warning to the whole telecom sector and not just to mobile satellite projects.

Meanwhile, the pilots of the COLTs , Viatels, Winstars, Teligents, Level 3s, PSINets, and Global Crossings thought they were still sailing the tropics, where low hanging fruit fell off of trade-wind waving coconut palms and tall, spearmint-leafed papaya trees. Almost uniformly, the new operators, whether CLECs, DLECs, Global Fiber Carriers (GFCs) or ISPs, whether headquartered in the U.S. or Europe or Bermuda (a popular base for the GFCs for tax reasons), focused on technology more than on overall costs, on financing more than on revenues, on market share (as assumed in their business models) more than on competition, on applications more than on services, and on alliances more than on the regulatory underpinnings of their various businesses. Although their business

models changed frequently and had to be amended almost daily, this was the New Economy, stupid.

And it seemed to work. Through "alliances" the new operators could trade capacity—and sometimes revenues—with other new operators, postponing the day they would need actual customers. By convincing themselves and their investors they would gain a 25% share of the market, even when there were a dozen or more competitors, they would continue to be financed, which in turn would keep them in the game and increase the chances they would meet their market share objective. By expanding coverage from city to city, country to country, continent to continent, they would maintain a vision of growth and expansion, which excited the shareholders even when 14 other CLECs were planning to cover Frankfurt or Kansas City, or seven other GFCs were planning new undersea cables between North America and Asia.

Virtually each new cable—and towards the end of the nineties, each new fixed wireless project—proclaimed a newer, higher level of capacity to boot, based on a new breakthrough in optical or spectral capacity, laser efficiency or signal compression technology. Yet most of the costs lay in constructing the fiber systems and activating them with electronic transceiver gear, or in gaining the rights to building roofs in the case of the wireless systems.

Still, it all appeared to be working. New trade associations were being formed with just the new operators, most of which had minimal revenues (though some like Winstar were approaching a billion dollars per year). But financing, not revenues, was the name of the game. The numbers had to be big, even if they were losses, to indicate the potential of the business once it went cash positive. Startups with more conservative plans, keeping costs and revenues in closer balance and needing only a few tens of millions of dollars to get going, were being summarily rejected by the I-Banks and the VCs, who together patrolled the tropical, alphabet seas.

4. CRASH UPON CRASH

For the most part tropical seas experience hurricanes and typhoons. Even the island in the south Caribbean, with which the author is pleasantly familiar and which lies outside the hurricane belt, is hit every 20 or 30 years with a "reversal," during which normal currents not only flow backwards but do so with a fury that creates 15 foot waves and destroys shoreline obstacles, whether garden walls, seafood restaurants or water-edge villas, the contents of which are liberated in a swoosh of the waves. All this results from the nautical aftereffects of a passing hurricane some 150 miles away. Every so often nature reverses its course.

Yet the nineties telecom boom was proceeding like an extended first act in a Verdi opera. We meet the cast of characters and all is blissful and idyllic. The second act, in which one or more of them start to perform horrible acts while others are befallen by tragedy,

refused to occur. The singing went on and on—the HMS Pinafore sailing gleefully and resolutely across the Queen's blue sea. To any student of opera—or the tropical seas—the Great Crash that disrupted twenty years of telecom growth and expansion was no surprise. But to students of telecom in the nineties what happened in 2001 was nothing short of cardiac shock, followed by seizure, ending in stroke.

Why did it happen when it did? And what caused it?

Theories of Crash and an Explanation

The first theory of why Crash occurred is that telecom carriers were overbuilding capacity. Simply put there were too many carriers—CLECs in Europe and the U.S., undersea fiber carriers across the globe, Iridium-type systems (such as Globalstar, ICO, Ellipso)—installing too many cables, transceivers, switches, and satellites. On top of all this broadband wireless carriers, with still more capacity, were starting to enter the market at the turn of the millennium. This would mean even more capacity being available at the level of metropolitan connections for business users. (One example of how much capacity has become available and how much is likely to be needed is a projection by TeleGeography of 3.5 Gigabits per second of lit fiber capacity across the Atlantic by the end of 2002 versus expected demand of only 0.5 Gbps.)

Domestically in the U.S. views have differed on how much fiber trunking capacity is being underutilized, with some analysts arguing that with Internet traffic continuing to quadruple each year, lit (that is, activated) capacity is being utilized at a 70% level on a majority of major intercity routes. However, even if this picture is correct, it is not complete, since much more inactivated capacity ("dark fiber") has been installed with the expectation that much of it would be lit by now, thereby covering much more of the interest charges on the construction work and fiber gear. In addition, improvements in signal compression continue to reduce the amount of capacity required per unit of transmission. Meanwhile, providers of high-speed access to residences and small businesses (which generate more demand for trunk capacity between cities), such as @Home, Covad, Northpoint and Rhythm NetConnections, have experienced bankruptcy.

A second theory puts the onus of the Crash onto the 3G auctions. When the British government managed to exact over $30 billion from Vodafone, Hutchison (operating though a proxy), BT, Orange (owned at this point by Mannessmann) and Deutsche Telekom for the spectrum licenses to launch next-generation mobile services in the U.K, this triggered the collapse of the sector. What had looked like a mad free for all—but at $6 billion per license was anything but free—resulted in unsustainable business models, even if one believed in the multiple service offerings of mobile multimedia, and signaled the beginning of the end. Some economists argued that to the contrary these "sunk" auction costs would not result in higher service prices and all would be well. They continued to voice this view even after Germany awarded six 3G spectrum licenses in mid 2000 (about three months after the U.K. auction), charging its auction winners about $8 billion each.

3G optimists saw the auctions generating a great deal of publicity and pre-selling for all the new 3G services Yet the operators that won the licenses started decelerating rather than accelerating their rollout plans, faced as they were with large infrastructure and interest outlays on top of the auction fees and lots of new service concepts but no clear "killer application." They also saw Hutchison back out at the last minute from one of the winning German license groups. At first this was interpreted as a rude and uncivilized act (increasing, as it did, the financial obligations of the remaining Dutch, German and Japanese partners by almost 100%). After a while most analysts realized this was a signal that auction prices were getting beyond the beyond and were not sustainable, even as Italy announced its upcoming auction and France set a fixed price of $5 billion for its four 3G licenses.

Meanwhile, the stock values of most of the U.K. and German auction winners started to drop, contrary to the pre-existing view that European mobile operators *had* to win 3G licenses in the major countries to demonstrate that they were staying in the game. Next the main 3G vendors, Ericsson, Nokia, and Nortel, started to announce victorious infrastructure contracts. Soon their stocks started dropping too.

A third theory revolves around the dotcom explosion and subsequent implosion. The growth of the dotcom companies and the exploding use of the Internet by corporate users during the second half of the nineties created huge new markets for telecom suppliers. Routers and date networking equipment as well as leased lines were central elements of the dotcom and intranet plumbing systems, which were being expanded at a furious pace. So when the dotcom implosion occurred in late 2000 and early 2001, a major drop in telecom sales also started to happen. IT budgets, which had been inflated by the "Year 2000" crisis (in retrospect more perceived than actual), were now deflated by the dotcom crisis. This in turn unraveled the business models of telecom vendors and carriers that were relying heavily on rapid, Internet-related business growth. Few vendors and carriers were exempt from this dotcom effect.

The fourth theory of crash is crosscutting. It asserts the bubble would not have occurred but for the greedy behavior of telecom CEOs. Driven by humongous salary and bonus packages and scale-based incentives, CEOs pushed the envelope of company growth. They made sure managers met key financial indicators and sales targets at the expense of overall company performance, not to mention, at times, ethics and honesty. The CEOs were aided and abetted by investment bankers (who could manipulate financial offerings and M&A deals to the executives' personal benefit), Wall Street analysts (who could reduce company benchmarks to simplistic caricatures as well as promote companies and executives), and headhunters (who could inflate the value of outsider CEO candidates). Interestingly, telecom CEOs had the lowest longevity in office across major industry sectors during the nineties. Growth and bonus objectives had to be achieved in a hurry.

As it turns out all four theories can be reconciled. The underlying reality is that the telecom sector ran out of cash in 2001. The banks, many of which had effectively become venture capitalists, funding project after project, company after company, on the

basis of what were highly optimistic assumptions, could no longer fund every spell checked (though often numerically-questionable) proposal that came along. The debt/equity ratios of their companies were getting out of whack, as was their ability to pay projected interest on outstanding loans. In Europe alone, for example, short-term debt requirements for 3G networks were being projected at about $200 billion, which was significantly more than the whole telecom sector (including old-fashioned telephone companies, new-age CLECs, 2G mobile carriers, satellite operators and regional undersea fiber projects) consumed in any previous year.

Something had to give. For companies like BT and Deutsche Telecom that were exposed to both 3G and dotcom risks the something was their credit ratings, which severely reduced their ability to raise both operating and investment capital and increased their interest payment costs. This is why BT spun off its mobile subsidiary, as did AT&T, in late 2001. It partitioned the companies' risk. For younger, single business startups, like Global Crossing or Winstar, the options were fewer. Crash came down on their heads.

The Crash Not Heard Around the World

The fiber explosion of 1997 to 2001 turned into the severest component of the telecom crash of 2000/2001. But realization of serious meltdown taking place did not occur very rapidly. Even as the fiber crash was well underway, more fiber capacity was being built and traded among the new fiber behemoths, some of which grew from zero to $50 billion in market value virtually overnight, tumbling back down to virtually zero before the next sunset.

As noted above, the first fiber crash went almost completely unnoticed outside Europe. Within Europe the fiber CLEC wave, ascending and crashing within a couple of years, was too great to miss. Multi-country CLECs announced plans to serve and interconnect the continent's major commercial and financial centers: Amsterdam, Barcelona, Berlin, Brussels, Frankfurt, London, Madrid, Milan, Munich, Paris, Rome, Stockholm and Zurich, among others. These included operators like C&W and COLT (Fidelity affiliate) that had experience in the U.K. market, which had been liberalized earlier, as well as Soros-affilaited Global TeleSystems, Global Crossing, Level 3, Metromedia, Viatel, Primus, Qwest (in conjunctionn with its Dutch partner, KPN), Fibreway, Iaxis, Storm, XO, wireless fiber carrier Winstar, and others. A second tier of players, such as Energis in the U.K., Versatel in the Netherlands, Jazztel in Spain, and their numerous counterparts in Germany, were focused mostly on their home markets.

The challenge of assembling the business plans for all these new CLEC and regional fiber ventures, almost concurrently, was gigantic It led to an overnight quadrupling of telecom strategy consultants in the European sphere. Because U.S. as well as European financing sources were to be approached, many of the ventures sought the help of U.S. consultants, whether locally based (especially in London) or imported across the Atlantic. The resulting financial mega models—using megabytes of storage—had hundreds of cost-related lines (down to the level of wiring individual offices in different classes of

office buildings), tens of lines for estimated revenue sources (voice, data, Internet access, VPN, ISDN, and on and on), but only one line for the item that turned out to be pivotal: market share. Generally, the number used was on the order of 20% to 25%. The incumbent, such as Deutsche Telecom, or France Telecom, or KPN, or Swisscom, was expected to retain a dwindling lead, with two or three new entrants sharing the majority of the market within two or three years.

The expectation, pushed by hungry CEOs, investment bankers and analysts, was that the CLEC business would follow the cellular market, which was generally limited to two, three or four facility-based carriers. Even as new CLEC ventures learned about a growing number of competitors, they continued to believe that most of the newcomers were not likely to be significant competitors. They were late entrants, not really serious or prepared, not likely to be well financed, not well managed, forgetting that the other ventures were discounting them on more or less the same basis. This kind of mutual discounting continued until the more conservative bankers (no longer generationally confused by their younger cohorts) and selected major investors started to put two plus two together. Two plus two, plus two more, plus another one here and another one there, plus the one Jacques just found out about, and the one that is scheduled to announce next week. Yikes! Mon Dieu! Mein Gott!

In March 2000 the European CLECs crashed. After spending more than $15 billion fibering (multiple times) the major cities, most of the secondary ones and the routes in between, many of the fiber carriers collapsed into bankruptcy, including KPN Quest, Pangea, and Viatel. According to the chairman of Jazztel, Michael Varsavsky, whose company was delisted by Nasdaq on May 31, the European fiber market was "killed by optimism." For whatever reason the rest of the world did not take stock.

Broadband Access and Convergence

In the U.S. the preoccupation of the industry, if you believed what you read in the trade magazines and heard at the conferences, was with "convergence" rather than crash. In the past *convergence* was a term used to denote technological unification. Computers and telephone switches were examples of convergence, once both were based on the same digital platform, as were digital cellular, digital television and digital data and voice communications systems. *Convergence* in its new, late 1990s manifestation referred to more than a common technology platform. In its New Age form, *convergence* referred to the unified delivery of previously separately delivered services. It was the next step, the next new thing.

RCN, which delivered telephone service, high-speed Internet access and cable television, was a new-style carrier, reflecting and exuding *convergence*. So did visions of next-generation 3G mobile multimedia, allowing consumers to receive voice, data and video by means of a single handheld device. The world was moving from converged technology to converged service delivery to the converged consumer, who would *stick* to the service operator because of the multiple service relationship.

Unfortunately, convergence like "stickiness" ran into some roadblocks. The combination of different services in a single package did not always mean they were the latest, greatest versions of each one. Picky or innovation-oriented customers still wanted to put together their own packages, using two, three or more different service providers. Non-picky ones sometimes reacted with sticker shock. Even if buying three services from a single provider was cheaper than buying them separately, the size of the unified bill scared some customers off. At the supply end training sales and installation technicians in the wider range of products on offer was not always a breeze, even if (a big *if*) the customer could be convinced that a CLEC could provide Internet access as well as an ISP could or that a cable operator could provide telephone service with the reliability of a telephone company.

The one exception was high-speed Internet access. Here cable-affiliated companies like @Home and Road Runner managed to capture a dominant share of the residential market, using a shared capacity architecture and cable modems. This was the good news for proponents of convergence. The bad news was that the market's overall rate of growth, so high in its early years, was beginning to slow down by the end of the decade. Both cable modem and DSL providers found that customer installations were more difficult and expensive to staff and execute than expected, as both telecom and PC expertise was required. They also both encountered customer resistance to the $40 to $50+ per month service fees they were charging. And they both were soon immersed in struggles over how to split the revenues with their respective operational partners, namely, the cable TV operators that retailed cable modem service and the telephone companies that provided—and sometimes provisioned—the telephone lines that carried DSL service.

Fiber Boom, Fiber Crash

The fiber boom of the late 1990s generated more than half a trillion dollars of value, measured by market capitalization. The precise amount is difficult to measure because of the fiber value component in multi-service, multi-technology firms such as AT&T as well as major vendors (Alcatel, Lucent, etc.). Undoubtedly, more than half of the value was generated by companies based in North America, including Bermuda. The rest was primarily European based, followed by Asia and Latin America. Probably a quarter or more stemmed from regional and intercontinental backbone investment and operations. Much of this was centered in a handful of companies, such as Global Crossing and Level 3, which at their apogee were worth about $50 billion each—and post-crash less than $1 billion.

Estimating the overall value of the fiber sector after crash is difficult. In terms of independent backhaul and metro operators, the loss in value (as of July 2002) has been on the order of 95%. Very few companies, such as Time Warner Telecom, managed to beat the odds. (These exceptions have generally lost 80% to 90% of their peak values.) Similarly, the technology vendors have experienced losses almost as great as those of the

independent operators. Even the diversification of the large vendors—into mobile as well as more traditional forms of fixed technology—rarely provided much cover. The difficulty, again, is estimating how much of the drop in value of AT&T and other long distance carriers as well as the Bells was due to their fiber exposure. Overall, however, their diversification and financial status served them better than did that of the vendors.

Bottom line: from, say, $0.8 trillion the fiber sector's value in mid 2002 was somewhere below $0.1 trillion or a hundred billion. The unimaginative moral of the story is that when the value of a sector becomes stratospheric, as reflected in most of the new fiber ventures, investor beware.

Auctions of the Century

Europe was also ahead of the curve with respect to the mobile crash. The vision of next-generation mobile communications—or 3G, as it is commonly referred to—was presented as a vision of ultimate convergence. Voice and data. Still pictures and moving pictures. The always-there, always-on terminal. Only implanted chips could push things any further. A convergence of mobile technology and biotechnology.

Even though few users were involved in the process, the move towards 3G progressed smoothly through 1999 and early 2000. There were some important unanswered questions, such as which new applications would trigger the market, whether corporate or general users would be the initial adopters of 3G, and how much and how (by the minute, the service or the kilobyte) users would pay. But these questions, along with more technical ones (for example, about the effective transmission speed of 3G technology, the interoperability of different vendors' hardware, the initial size and availability date of 3G terminals) were no match for the buzz and hype that was being generated though industry publications, presentations and news events. The European mobile industry was working itself up, if not yet its customers, to a foamy froth. The stir was creating 3G latte, if not yet actual 3G.

The first 3G auction was launched in March 2000 in London. The U.K. government was eager to take this lead position, seeing, in your author's view, numerous ensuing benefits. The U.K. economy would benefit by means of the new ventures and jobs that would be created. Its banks, law firms, advertising agencies, production houses, Internet businesses, and consulting firms would be able to export expertise in 3G, in mobile multimedia (including creative and intellectual property aspects), and in auction structuring and management to other countries. (Spectrum auctions were advanced initially in the U.S. by the Federal Communications Commission but their early 3G-related implementation in London could—and would--position the U.K. as the new auction paragon with respect to Europe, the Middle East, Asia, Africa and other parts of the world.)

The auction could also serve to solidify the U.K. position as the center of convergence in the new telecom/Internet marketplace. London area consultants had dusted off their old

videotext reports from the early 1980s and were arguing to anyone who would listen that the new applications of 3G mobile multimedia would spread like wildfire through the economy. Their spread would be hastened by the emergence (via mergers, acquisitions, consortia and/or startup ventures) of new "converged" enterprises, combining content, transmission, and Internet elements. These entities, using 3G spectrum licenses to establish themselves, would then become the crux of a new mobile multimedia economy. The 3G business model, later adopted by most of the license applicants and spectrum bidders, also emerged at this time. Within a year or two of startup, according to the model, 3G operators would be generating significant revenues from ten or more service lines, only one of which would pertain to voice transmission, the remainder to data and multimedia applications.

The only problem with the theory--not really noticed or acknowledged at the time--was that few media companies showed up for the auction. (Virgin and EMI were the main exceptions out of a total of over twenty-five participating investment groups, organized into a dozen bidding consortia). And these dropped out of the bidding before it became truly stratospheric.

Instead, the five survivors who collectively paid over $35 billion just for the right to build 3G wireless networks--and the spectrum over which they would work--were the four incumbent U.K. cellular operators (Vodafone, BT, Orange and One-2-One) and a fifth "newcomer" group dominated by Hutchison Telecom from Hong Kong. (Hutchison had until the preceding year controlled Orange, one of the U.K. operators, which it sold to Germany's Mannesmann. It was a virtual incumbent.) The incumbents paid the prices they paid partly because of the structure of the auction, organized as it was to maximize revenues for the U.K. government's treasury, partly because of the 3G hype, and partly because they assumed their respective stock values would drop if they failed to win licenses.

The other major auction that contributed to the 3G shock of 2000 was held in Germany. Unlike the U.K. the German auction did not fix the number of licenses that could be won. It allowed for a range of four to six, depending on how aggressive the bidding would be. Game theory experts projected that either six licenses would be issued at reasonable prices (significantly lower than the U.K.'s) or five and, possibly, even four at much higher ones, as bidders would only pay such amounts if they could eliminate competitors as well as gain more spectrum in the process.

The end result, however, after several weeks of bidding, was that six licenses were issued at extremely high prices (about $8 billion each) for a collective draw of $46 billion. (Auction specialists are still arguing whether the German prices were higher or lower than the U.K. ones, given the respective populations, amount of spectrum, license duration, etc.) The other shock was that Hutchison, which was bidding together with KPN of the Netherlands (principal owner of German incumbent operator E-Plus), dropped out of the auction in the last round, effectively forcing KPN to double its investment—and contributing to its near-bankruptcy later in the year. What

unsportsmanlike behavior, the Euro rumor mills quickly opined. Those unpredictable Asians.

3G Boom, 3G Bust

It turned out that Hutchison was possibly the only major 3G auction player to maintain a sense of proportion. Dropping out of the German auction reflected its long-held practice of reviewing a major investment decision at the last moment before a final commitment is made. In the process Li Ka-shing and his senior executives take into account the group's overall position and exposure (including in the several non-telecom parts of the group) as well as the value/risk ratio of the investment that is about to be made. Obviously being one of six 3G operators in the German market while paying over $8 billion just to get in the door did not pass the test. Unlike the other bidders, Hutchison had actually experienced a market with six mobile operators competing to the point where only one, if any, was profitable: Hong Kong.

The $8 billion price tag presumably did pass the test at Deutsche Telekom, Vodafone (acquiror of Mannesmann), Viag Intercom (owned principally by BT), Telefonica and Sonera, Mobilcom (owned partly by France Telecom) and KPN (together with its partners, BellSouth and NTT DoCoMo, but not Hutchison). All of these players emerged as "winners" of 3G--or UMTS, as the Europeans called it (for Universal Mobile Telephone Service)--spectrum and licenses.

Most of the above companies' stock, the publicly traded ones, dropped dramatically after the German auction, particularly once the credit rating agencies had calculated the impact on their respective debt structures and interest rates.. BT ended up splitting off its mobile operations, including the German 3G license, in order to reduce its no longer supportable debt burden. Mobilcom, a incumbent German cellular service reseller, remains on the verge of bankruptcy while negotiating its restructuring with France Telecom, while the credit ratings of the latter and of Deutsche Telekom have been significantly downgraded. Instead of loosing value due to not winning 3G licenses, several of the European operators lost value—massively, some would say—because they won 3G licenses. Even Vodafone, with its unique position among mobile operators, was by mid 2002 worth well below half of its value prior to the U.K. auction.

In short, the 3G auctions and high licensing fees broke all kinds of records. They also broke several corporate piggy banks. Collectively, once France, Italy, Austria, Switzerland, the Netherlands and most of the other European governments exacted their tithes from the license bidders, well over $100 billion was committed, with about half of it due right away. This is when the bankers who were expected to arrange the debt financings stared to have serious second thoughts. Suddenly the unproven business models did not look so convincing. They made for a better smoke than collateral.

The real search for a viable 3G business model only began at this stage. Late 2001, early 2002. The new candidates included evolutionary network strategies such as are being

adopted by CDMA operators in South Korea, Japan and the U.S. as well as shared network approaches, being advanced in Europe and some Asian markets as well. 3G Lite. Still, the demand side of the business model remained enigmatic. What would subscribers pay for? Corporate data and Intranet access? New kinds of voice services? Location-based information and transactions? One operator concluded that 3G stood for "Games, Girls and Gaming." A *Wall Street Journal* commentator called it the "European moonshot." Another observer defined it as Unproven Market, Technology and Services: UMTS.

5. POST-CRASH RECOVERY

Addressing the issue of telecom future or futures is a challenge, both general and personal. Having foreseen the fiber crash, having critiqued bullish forecasts of high-speed access penetration, having assessed the limited viability of the 3G business model (particularly when burdened with high auction fees and coverage requirements), and having projected the dotcom implosion, your author nonetheless failed to recognize the aggregate impact of all these occurrences. The sector, robust as it appeared to be, could not cope with the simultaneity of it all, together with a general recession.

Looking ahead the key issue is how long crash is likely to go on. If a bounce-back should occur relatively soon, then the sector could still conceivably return to "normal," as we came to know it in the late nineties. (Many operators and especially vendors continue to hold to pre-crash strategies and business models, contending these have been put momentarily on hold until the market adjusts to the recent setback.) Yet increasingly the probability of this *easy* scenario, no matter how great its sentimental value, is dwindling. More likely, significant change can be expected, as has usually been the case after the bursting of major economic bubbles. The slowdown can last five to ten years. The recovery can take forms hardly imaginable prior to crash.

Scenarios of "Back to Normal"

Already visions of a telecom industry dominated by a few mega-players are resurfacing, echoes of the early eighties and nineties. This is despite the fact that major consolidations have not started to occur. But the rumors and foreplay persist. First Alcatel and Lucent, then Nokia and Ericsson, then SBC or Verizon and WorldCom or AT&T, and so on. And who will buy Sprint? And Qwest? And VoiceStream (now T-Mobile but possibly for less than a few months)? The acquisition opportunities proliforate but few big players can take on additional debt.

In contrast the trendy plays during the immediate post-crash phase were bankruptcy restructurings orchestrated by a bevy of distress financing companies or smaller telecom players, such as IDT, which took over a previously-thought mid-size warrior like Winstar for less than $45 million. The one prospective large merger that made it past the rumor

stage is not usually considered a telecom play. It involves Echostar's takeover of Hughes DirecTV (and, in the process, of PanAmSat), and may fall by the wayside due to the Justice Department's antitrust concerns as well as lobbying by various affected interests.

It all makes the author wonder whether the proponents of the" few big telecoms will rule the world" scenario have studied history--not Herodotus or Plutarch, just recent telecom history. As long as the industry remains dynamic this scenario is unlikely to occur. In fact the only reason the scenario may have more validity now is that the industry may temporarily lose its dynamism due to the broader economic slowdown. Even so, who would be the aggregators? More likely the sector would return to its pre-competitive, feudal-like structure, with numerous national players. Geneva could re-emerge as capital city once more.

How the local telephone giants would react to such stasis, an antecedent of which we are already experiencing, is the interesting question. In the U.S. younger analysts have often assumed they would use the opportunity to take over emerging service markets such as ADSL. However, so far at least, this has not been the case. The incumbent operators are not eager to incur more debt—and possibly more regulatory wrath—even as the opportunity to wrest control of high-speed access presents itself so clearly. This suggests that they will either cool their powder or turn their attention to some other arena now that the threat of competition in the business sector is significantly reduced.

That other arena could conceivably be video-on demand (VOD), which might allow them to settle some scores with the cable TV operators, whom the telcos were unable to confront effectively in the nineties for various reasons, including pressure from the CLECs and DLECs and their own "early" (a generous word) understanding of the entertainment content business. (Will they understand Hollywood and the sports leagues any better in 2005 or 2009?) It could also be long distance services, although regulatory resistance in some states and at the FCC is proving to be a short-term cul de sac. Perhaps the promise of installing more broadband access lines by the telephone companies would incur some regulatory—or legislative—relief.

So the predominant scenario within the industry, on the non-gloomy days, remains what can be termed "Back to the Future." Essentially it foresees a resumption of the state of affairs *quo ante,* namely prior to Crash. As soon as the recession is over and growth recommences the telecom sector will be driven again by the demands of the dotcom economy, globalization, telecom-related productivity improvements, and the migration of the mobile wireless world to 3G multimedia.

Of course a few things will have changed—to a greater or lesser degree largely depending on how long it takes to resume full economic growth. There will be fewer dotcom companies, at least until another wave of exhilaration and innovation has time to build up. There will be fewer telecom carriers, fewer vendors (especially in terms of the more extended ecologies that the larger vendors support), less competition. Corporate expansion of Intranets and B-to-B commerce may resume at a somewhat lower energy level than before. And 3G wireless networks may be deployed in a new "3G Lite" style,

as Vodafone and other major operators have proposed (less capacity, slower data rates and rollout, fewer applications) or on a shared network basis. (This assumes Hutchison or another early entrant will not quickly discover a capacity-guzzling killer application.)

Your author doubts that such a return to a more sedate but still future-driven version of the late nineties is likely in the short term, although technological developments could still ignite aggressive pockets of industry behavior. One example would be wireless VoIP. Several Japanese companies are working hard on the breakthroughs needed to make this a practical success. The result could be a significant cost reduction in providing what is likely to remain the dominant application of 3G mobile networks for some time to come, voice connections (hopefully higher quality *and* cheaper ones), allowing voice to continue to subsidize data services until the market for the latter matures.

Will Surprises Replace Crashes?

The third scenario is not really a scenario. It is an admission--or a recognition--that the telecom sector is driven as much by events as by scenarios. And some of the most powerful events of the industry are surprises (sometimes even to the winners, not to mention the losers). When AT&T's consultants in the early 1980s projected fewer than a million cellular subscribers by 2000, the company decided to abandon the field (later re-entering it through an $8 billion dollar purchase of McCaw).

By 2000 there turned out to be over 500 million mobile subscribers worldwide. (The author's firm's projections of cellular growth in the early eighties were considerably more optimistic but still quite low compared to what happened.) Much of the nineties, in fact, were a time when mobile operators, particularly in GSM-driven Europe and the developed parts of Asia were where the money was, even as the industry kept looking for the fountain of youth on the data side, although the end of decade surge in high-speed access looked promising.

The quick take-up of the Web, the quick growth of carrier competition in a market like Germany (which had resisted challenges to DT for so long), the emergence of the Vodafone Group as the largest telephone entity (in terms of subscribers) in the developed world (beating AT&T, NTT, Deutsche Telekom and others), the quick spread of fiber capacity to and within major cities of the developed world and to major coastal cities of the developing world, and the dramatic prices and effects of PCS (U.S.) and 3G (Europe) auctions were some of the other major surprises that shaped the industry during the last decade. What similar kinds of surprises can be expected for the next?

The answer is undoubtedly "several." Perhaps Vodafone will go on to buy out several major (but ailing) fixed carriers, having already acquired one of the top three fixed carriers in Germany and Japan—perhaps Vivendi Telecom, BT or Verizon are next? Perhaps Echostar—after acquiring DirecTV and PanAmSat (or perhaps even more so if it fails to do so)—will launch a next-generation satellite providing high-speed access to

residential and business users directly as well as through wireless LANs deployed in public spaces? Perhaps a new Internet will emerge, making the current one look like the strip malls of the 1950s?

The fundamental question is what underlying conditions and opportunities will allow what appear as surprises to most telecom users—and even most pundits and insiders—to arise. Will the industry in its reconstituted form be driven most by technology and finance, as it largely was during the late nineties, by market understanding and competition, as it was during the preceding phase, or by regulation and government, as it was before that? Part of the answer to this question will depend on where the blame for telecom crash is placed.

Allocating Blame and Responsibility

In the midst of the Worldcom scandal and the wake of the Global Crossing and other recent telecom bankruptcies, the issue of whom and what to blame for mismanagement and potential malfeasance has risen to the fore as it has with respect to corporate governance and regulation in general. This has been especially true in the United States, although headline expressions of concern about excessive executive compensation and unwarranted corporate and regulatory behavior have surfaced in Europe and Asia as well.

While there are many parallels between the accounting, compensation, and other practices that are being challenged with respect to non-telecom firms, such as Enron or Merck, and telecom ones, there is a significant difference as well. In the general corporate arena, the question of how widespread the "deviant" behavior has been continues to be debated. In the telecom case, it is relatively clear that the problem, whatever it has been, is not limited to one or two isolated cases. Most of the previously highly valued firms in North America and Europe have been suffering the consequences. Many contributed to the problem in the first place.

In broad terms the problem has been a lack of controls. In the hectic flurry of fiber extension around the world and across metropolitan areas, of wireless escalation to the next generation of technology, and of pervasive dotcom explosion, the emphasis has been on action, on pursuit of opportunity, rather than on thought about the wisdom of doing so. The traditional sources of conservative hesitation, including elder Board members and executives, professional advisers (bankers, accountants, lawyers, engineers, consultants) and regulators have more than occasionally not behaved to form. True there have been exceptions. Asian cities have generally avoided the simultaneous influx of ten or twenty metro fiber carriers, thanks presumably to the overall financial crisis from which these markets have been recovering. U.S. mobile operators have not gone as gaga over 3G as have European ones, partly at least because of less government and vendor pressure to do so. Conversely, European carriers and vendors were less caught up in the dotcom explosion than were their American counterparts, although their lag was shortening as time went on.

Still, overall the telecom sector has experienced an unusual breakdown of checks and balances, particularly with respect to entering new service and equipment markets. The due diligence process has not been functioning as meant to be. With money flowing freely neither the banks nor the national treasuries exhibited their usual concerns. Nor, perhaps even more curiously, did some of the telecom regulators. They were increasingly seeing their mission as one of sector promotion rather than as keepers of public trust. "What we are living through is truly revolutionary," stated the Chairman of the FCC in early 1999, citing various instances of high growth in stock values as well as jobs. Once the auction function was added to the mix, things became even more confused.

Alternatively, regulators were pursuing theories of regulation based on limited practical experience. In the U.K. and Germany, for example, the regulators made relatively rapid swings during the 1990s from support of monopoly (Germany) or duopoly (U.K.) to support of open markets, where virtually any newcomer could obtain a license to be a facilities-based carrier.

Of course, the theory assumed that bankers would filter out unsuitable candidates by not lending them funds. Alternatively, the unfit would be weeded out by the competition in the marketplace. What the theory did not contemplate is that other operators, fit or unfit, would buy out the unfit players for easy cash or inflated stock. Both commodities flowed freely during the late nineties. As a result, the process of winnowing out the unfit operators was suspended as the sector adjusted to the growth in cash and only came to a head once quite large entities—in terms of market valuation, employment and, in a few cases, even revenues—were involved. It is (and has been) the relatively simultaneous collapse of such larger entities (and many smaller ones, which these entities support) that has produced crash and its various social, political and economic accompaniments.

Why the bankers lost their senses is an equally interesting question. One can only presume that they followed the guidance of the stock analysts in a specialized field like telecom. The analysts, meanwhile, were contending with voluminous deal flow (acquisitions, mergers, IPOs) as well as highly dynamic changes in technology and services. They sought out industry benchmarks that would help them track and guage individual companies. In the mobile area, after initially focusing on subscriber penetration, they moved to ARPU and average subscriber activation cost. In the fiber area, they paid attention to indices such as miles of fiber laid, number of cities activated, or points of presence. Once the benchmarks were established operators worked to achieve appropriate increases—or, alternatively, reduced rates of decline--in the respective index or indices. Little matter that over time some of the indices became abstractions. A mile of lit fiber with collocation and local connectivity may have many times the value of its unlit counterpart, yet even the footnotes to the analysts reports did not always reflect these important distinctions.

The analysts may have also faced conflicts of interest as they evaluated companies that their respective investment banking divisions were serving or courting. Even in the absence of such conflicts the heightened flow of the industry presented new challenges.

Short cuts were needed for evaluating companies. Limited benchmarks were overly relied upon. Too many reports were hurriedly assembled. Lest it be forgotten, all this happened within a financial services industry where companies and managers were under more competitive pressure than their telecom counterparts. Goldman Sachs versus Morgan Stanley. Citicorp versus Merrill Lynch. Caine versus Abel.

Nor was responsible leadership highly evident at the oversight level, whether corporate or regulatory. The SEC only became a visible public factor in 2001. The FCC, which has withdrawn the licenses of a number of wireless carriers on the grounds that they failed to meet their deployment obligations, has potentially exceeded its jurisdiction versus the bankruptcy courts in the notorious NextWave case, as presently under review by the Supreme Court. In the fiber area, it is hard to come up with any examples of the Commission's intervention, possibly in part due to shared responsibility with the state-level public utility commissions (although this potential limitation would not apply to the proliferation of undersea fiber projects). The overall trajectory of regulatory involvement in telecommunications has, after all, been on the decline, particularly with respect to policing activities.

The sole interventionist move that stands out during the nineties was an FCC Chairman's quick negative response to SBC's rumored interest in acquiring AT&T. (Allowing such a merger to go forward might have cooled some of the soaring, Icarus-like IPO and fiber technology fire of the period.) More recently, the current Chairman has indicated that the agency could allow a Baby Bell to take over Worldcom, taking into account the declining state of the market. He has since qualified this position by indicating that industry consolidation should not be allowed at the expense of reduced competition. This is the most interventionist, apart from actions to safeguard service continuity, that the FCC appears ready to be in mid 2002—intervention *not* to prohibit a market-driven development. Will such a passive stance last very long?

Crash of the Telecom Business Models

The question of where to place responsibilities should not distract the reader from the essential issue. Without sufficient exercise of watchdog responsibilities all the players supported highly vulnerable business models. While the models were typically engineered by young MBAs, the CEOs and CFOs set the tone. At the same time, how the models could be reviewed repeatedly—yet remain largely unchallenged—by venture capitalists, investment bankers, senior management and due-diligence performing consultants, not to mention knowledgeable investors, remains at issue. Part of the explanation is the culture of "detail"—added to the absence of serious watchdogs—that enveloped the models and prevented them from being assessed fundamentally. Permit the author to explain.

When the financial model for a new type of business is first developed, it can be as small as ten lines. A few cost categories and one or two revenue lines. By today's standards this would be considered a very crude model, yet it may have advantages over the type of

detailed models that came into being during the telecom boom. The models for competitive fiber carriers, 3G mobile operators, undersea around the world cable layers, or wireless broadband players that came to dominate the late nineties and remain the state of the art were hundreds, even thousands of lines long. They took advantage of the more powerful, faster laptop PCs that had become available—to the point where one's laptop's capacity and speed came to be equated with the owner's virility.

With this new modeling technology in place, detailed assumptions and results dominated the long review sessions that often took place. Each issue had to be addressed and resolved. For example, what cost figure to use for the fiber that would connect local termination nodes and individual premises in tall office buildings? Would it depend on the nature of the conduit, of building codes, of existing internal wiring, of the average size of the office occupants, of expected customer response, and so on? This was in stark contrast to similar review sessions in the 1980s. Then the bulk of the review time was spent on getting proportions right with respect to costs and on arguing out major demand assumptions. There was less detail but more emphasis on proportionality and benchmarking with other comparable businesses.

The mega models of the late nineties, the immense detail notwithstanding—or perhaps due to the megabyte upon megabyte of detail—generally had three shortcomings. First, they tended to overestimate the portion of project costs ascribable to the key technology involved (fiber, wireless broadband, 3G infrastructure, etc.). Conversely they underestimated other costs, whether acquiring rights-of-way or antenna sites, leasing capacity on third-party networks, interconnection fees (which WorldCom tried to hide as capital expenses), construction, maintenance, taxes, and so on. Second, they generally expressed demand in applications-based revenue streams (often as many as a dozen separate ones, quite a feet for a startup business) rather than in terms of customer requirements and market segments. Third, and most egregiously, they underestimated competition—not by one or two entrants but at times by 10 or 20—and overestimated market share.

With all the focus and attention the business models received, how could these fundamental flaws have been present so repeatedly? It's a good question. Were there no little voices in the back of the head crying out that the models were optimistic on one count, two counts, all three counts, as they were being reviewed? Was it a matter of too much specialization—with the junior staff thinking someone else must be handling the hardnosed due diligence and the senior reviewers, not highly literate, trying to fathom how these computer models worked to begin with? Or was the pressure from the CEO downward to make look good so great that all the "little voices" could talk about were the bonuses that lay ahead?

In the end the business models reflected the false premises of the telecom entrepreneurs (most of whom, unlike their dotcom peers, were old-age veterans with visions, however, that captivated their New Age subordinates) and the false hopes of the funding sources. How many global or trans-Atlantic fiber carriers could the world support? How many 3G licenses worth $8 billion could the German mobile market support? These fundamental

questions got lost in the detail. Overall, financiers and technologists dominated the high rolling telecom culture of the late nineties. The marketers and regulatory experts that held more sway in the eighties were relegated to supporting roles, as were often telecom network managers with operational experience.

Renewal of the Government Role?

Taking the pulse of the global telecom industry in mid 2002, it is still possible to conclude that governments will continue to reduce their traditional involvement in the telecom industry. As things return to normal, the assumption in most countries, including increasingly the smallest, poorest and most remote, is that governments will continue to privatize, liberalize and add competitors to their telecom mix. Those that already have three or four facilities-based operators, whether mobile or fixed, will have five, six or more. Those with two will have three or four, and those with one will soon have two. Correspondingly, those that have a government-owned operator will corporatize it, those already corporatized will find a foreign operator to be their strategic partner, and those with such partners will have IPOs (as soon as these come back to life) and become privately owned—in the majority and eventually wholly.

This evolutionary model, endorsed by the World Bank and other multilateral institutions in the early 1990s, could in fact be played out in the remaining years of this decade. Yet there are growing reasons to question its realism. Of the twelve largest countries in population, the principal telecom operators of nine are still wholly- or majority-owned by their governments. This includes not only the operators in China and India but also in Japan, Russia, Germany and Indonesia. Equally important, the principal telecom operators (often still the only ones) of almost all the 150 smallest countries are government controlled, as are many of those in the middle-size category, such as Egypt, France, Malaysia, Sweden, or Turkey. In short, the strategy of successively reducing the role of government in telecom management is nowhere near as inevitable in practice as it is in theory.

In some cases government retains an ownership role in telecom because it—or the telecom labor union—wants to. Increasingly, it is because qualified and interested buyers cannot be found. Take Bezeq, the Israeli national operator, as an example. Even before the renewed recent disturbances in its home market, no "strategic partner" was ready to step forward to bid for a controlling stake, as the author personally found out on behalf of an investment group. The withdrawal of the Baby Bells (now only four in number) from most international diversification contests, the debt problems of the European operators, the financial crisis experienced a few years ago by their Asian counterparts, and the growth of mobile and other forms of competition, have left few candidates standing for what in the early nineties would have been considered obvious privatization opportunities. Smaller, poorer, more remote and/or financially stressed countries face even greater challenges, as witnessed by the recent suspension of privatization efforts in the Czech Republic, Nigeria,. Paraguay, Poland, Taiwan, Turkey, Uruguay and elsewhere.

The buyers that have approached telecom privatizations in recent months, if any, have generally been the same ones that approach bankruptcies. They are bottom fishers. Distress financing specialists. Their commitment to the telecom sector is hard to measure. Moreover, there are signs that even these types of speculative investors are turning away from the risks and complexities of the sector. Correspondingly, the stock market appears to be crediting the value of government ownership in the face of growing company failures. (The price of France Telecom shares rose in mid 2000 on the rumor of a government buyback of some privately held shares.) Undoubtedly, some governments that have not yet privatized their PTTs or have done so only partially will re-assess the current model of telecom modernization.

Combined with government's role as a major IT user, its growing concerns about stock market manipulation (which, apart from Enron, have arisen to date primarily with respect to the telecom sector), and its traditional regulatory functions, its continuing ownership presence in telecommunications cannot be dismissed. In fact, a growing focus on new modes of public-private cooperation in the management of telecom entities that remain partly or wholly government-owned could emerge over the course of the next decade. Whether such cooperation will involve outsourcing, mixed ownership or government financing, it may be called for by the operating requirements and conditions of many of the world's developing countries for some time to come. However, will the potential drawbacks of greater government involvement in the sector be kept in mind? This question—and the search for balance that it implies—will need to be in mind.

Possibly we may even see more direct regulatory intervention in developed markets. There is certainly room to argue that the crash calls for limiting the number of entrants in some telecom markets and for increasing the financial scrutiny of those allowed to operate. Conversely, the crash experience can be seen as cleansing the market of excessive exuberance for some time to come. Regulatory intervention could cause more interference than benefit—at least, until the lessons of crash are forgotten. At the same time there are lingering signs that few lessons have been learned.

The challenge of ascertaining the government role is enormous. The crash of 2000/2001 and now 2002 should remind us for some time to come that business and government models which are adhered to with excessive enthusiasm can run their course in less time than today's fast-track depreciation schedules. Success can breed excess. Stability is situational. Technology can cause delirium as well as improve delivery. Surprises are endemic. These are the lessons of history—of the early and late eighties as well as nineties—at a time when history may be undervalued. In the time of boom. And the time following crash.

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