Chapter *1*

On the Menu— Telecom Services

Telecommunications has made rapid strides over the past quarter century. We've gone from a limited selection of desktop phones, controlled by a government-sanctioned monopoly, to a virtually endless choice of wired, wireless and Internet-based communications services. Although many people complain about today's chaotic telecom market, they probably don't remember the limited, high-priced communications options that were available before the telecom boom of the 1980s and 1990s.

Telecom will continue to advance at a furious pace over the next couple of decades. Even the humble home telephone, a mainstay since the days of Alexander Graham Bell, will likely disappear, perhaps replaced by an Internet-based communications appliance or by an Internet-connected mobile phone. (This is a trend that may already be happening in light of the fact that the number of U.S. residential phone lines has been falling since 2001.) Ultimately, people will probably have one phone and one phone number that they'll use both at home and on the road (and they'll take it with them wherever they travel in the world).

In many respects, today's telephone service is little changed from the technology our grandparents used. Despite advancements on numerous technological fronts, as well as the widespread use of mobile phones, most people still think of telephones as those familiar little devices that sit on desks, nightstands, and end tables.

This situation will soon change. Over the next few years, several developments will combine to make telephone service more innovative, less expensive, and increasingly useful. Although conventional telephones may linger on for a decade or more, people will increasingly rely on alternative telecommunication modes to keep in touch with friends, family, and business contacts.

1.1   END OF THE LINE FOR WIRELINE?

The U.S. carrier market is facing a tough and uncertain future, as total wireline service revenues continue to dwindle. In-Stat/MDR, a technology market research firm located in Scottsdale, Arizona, finds that long-distance service providers are the group facing the greatest challenge, as their core revenue sources—voice and long-haul private lines—show the greatest revenue declines. Long-distance providers also have very little market share in the few growing consumer telecom services, most importantly broadband.

"Over time, as wireless continues to mature and becomes seamless and reliable, the need to put up new wired infrastructure will decrease to the point of no longer needing it," predicts John Bartucci, senior director of product management for Telular, a wireless equipment manufacturer located in Vernon Hills, Illinois. "It's a question of putting up poles and stringing wires, or digging trenches to lay cables, versus putting up wireless towers. Assuming there are no health risks associated with all the wireless stuff we've got floating about, I believe that we could see the end for the need for wired technologies in the next 50 years."

The old-line regional Bell operating companies (RBOCS), which until recently enjoyed steady revenue growth, are entering a period of increased market competition from wireless services, cable operators, and IP Telephony. For U.S. carriers, as a whole, their continued financial health will rely heavily on cost management. In face of declining service revenues, U.S. carriers will need to control both their capital and operational costs if they are to remain profitable. Carriers also need to develop strategies that will help them to continue to grow their data services, thereby offsetting losses in voice. Even with strong data growth, it remains to be seen whether service revenue levels will ever return to those of 2001, reports In-Stat/MDR.

As the number of plain old telephone service (POTS) lines dwindle, digital subscriber line (DSL) technology will become increasingly important for U.S. carriers. DSL remains the primary method of broadband service for U.S. carriers. According to In-Stat/MDR research, SBC and Verizon account for over half of all DSL lines in use.

For U.S. carriers, business data services will be a major growth area, as business needs for these services are continuing to expand. Data services include both the old private line standard and newer Internet access services. The outlook for traditional voice services is bleak, however. According to In-

Stat/MDR, the total long-distance voice market is on a downward spiral, with double-digit decreases in 2003 and 2004. The local market, although overall not as competitive as long distance, will see revenue declines of 4 to 6 percent over the next several years.

1.2   THE BROADBAND WORLD

As wirelines decline, the need for secure, speedy, and on-demand video, voice, and data services is rising. This "triple play" is propelling cable multiple service operators (MSOs), traditional phone carriers, and the consumer electronics industry to develop and distribute the means to transmit information to users worldwide.

By 2008, over 15 percent of households worldwide will have some type of high-speed broadband connection, predicts ABI, a technology research firm located in Oyster Bay, New York. The highest share of households will be in North America, followed by Western Europe, Asia-Pacific, and the rest of the world. ABI also finds that while cable broadband is leading in the United States, the worldwide DSL market share as of 2002 is around 60 percent, whereas cable broadband holds about 40 percent of the market.

But the desire to acquire more subscribers, while retaining existing ones, will spearhead the bundling and inter-reliance of "boxes" with any one or more of the triple play services in more creative ways over the next few years, leading to attractive price points and inventive services.

In the past, cable MSOs and consumer electronics vendors have had a disconnect in the way that they have offered services and products to consumers. "There always existed the 'chicken or the egg' arguments as to whether consumers should buy the products first based on the product's standalone features, or should the products be developed first and be made available for subscription to one or more of the triple play services," says Vamsi Sistla, ABI's director of broadband research. "Now, the unlikely bedfellows are seeing one another as necessary for survival."

Although worldwide digital cable households made up less than 9 percent of cable households in 2002, this share will grow continuously to reach just over 20 percent by 2008, forecasts ABI. However, this figure will represent only 7 percent of all the worldwide households as of 2008. The digital broadcast satellite (DBS) share of worldwide households will be over 12 percent in the year 2008.

Video-over-DSL will be the new kid on the block, with U.S. incumbent local exchange carriers (ILECs) and competitive local exchange carriers (CLECs) charging ahead with aggressive deployments to fend off cable's triple play offering. Even with higher growth rates, North American household video-over-DSL penetration rates will be trailing those of the Asia-Pacific region by 2 million, in the year 2008, forecasts ABI.

1.2.1 Broadband Over Power Lines

Although cable and DSL connections are the current broadband access leaders, a newer technology could prove attractive to millions of potential users, particularly residential and small business customers. If it ever reaches market, broadband over power lines (BPL) would turn every home and office electrical outlet into an always on Web connection, potentially providing stiff competition to cable modem and DSL service providers. The technology "could simply blow the doors off the provision of broadband," FCC chairman Michael Powell stated earlier this year.

BPL works by injecting data into medium-voltage power lines. Amplifiers are required at intervals along each line to keep signal strength at an acceptable level. Conventional fiber optic or copper phone lines are used to bypass high-voltage lines, which are too electrically disruptive to carry data. The carriers believe that ubiquitous BPL would provide broadband service to customers, including rural homes and businesses not currently served by cable modem or DSL providers, at comparable data speeds.

BPL is a viable technology, says Alan Shark, president of the Power Line Communications Association, a trade group located in Arlington, Virginia. He notes that BPL's technical hurdles, such as passing signals through transformers, have been largely overcome. The companies are now focusing on BPL's business case. "They're trying to figure out how to bring [BPL] to the home in the most cost-effective manner."

Despite its potential, BPL faces opposition in the wireless community. BPL's strongest opponent is the American Radio Relay League (ARRL), the national association of amateur radio operators. If widely deployed, BPL would represent "spectrum pollution" on a level that's "difficult to imagine," says Jim Haynie president of the 163,000-member ARRL, which is headquartered in Newington, Connecticut.

Haynie maintains that data signals radiated by power lines will seriously degrade amateur HF and low-VHF communications, both data and voice, at frequencies ranging between 2 and 80 MHz. He notes that BPL interference could also seriously affect national homeland security efforts. Many military, police, and public service radio users operate in the same 2 to 80 MHz spectrum range, and some of these organizations are presently unaware of BPL's potential threat. "In terms of interference potential on HF and low-VHF frequencies, nothing is on the same scale as BPL," says Haynie.

Haynie notes that BPL technology already has been deployed in some European countries and that hamoperators there have experienced interference from the systems. He adds that Japan—responding in part to concerns expressed by its amateur radio community—decided last year not to adopt the technology because of its interference potential. Shark, however, maintains that the ARRL's fears are overblown. "In the tests so far, there has been no interference," he says. However, Shark does admit that the "potential perhaps

exists that if somebody had a [ham radio] rig right by a transformer, there could be a potential [for interference]."

Haynie, however, dismisses Shark's claim. He notes that recent field tests, conducted by the ARRL's lab manager in BPL trial communities in Maryland, Virginia, Pennsylvania, and New York, showed strong and sustained interference across all affected ham bands. "Anyone seeing these BPL signals for megahertz after megahertz for miles along a power line should be convinced that BPL—even operating at the present FCC limits—poses a serious threat to all HF and low-VHF communications."

1.3   THE UPCOMING MOBILE STALL

Given the fact that POTS is in decline, it only makes sense that the mobile phone service market must be soaring. And it is, although even runaway growth has its limits.

The next five years will see a dramatic slowing of worldwide cellular subscriber growth, reports In-Stat/MDR. However, despite much noise about a pending catastrophic slowdown in subscriber growth, there will be more than 931 million new subscribers over the next 5 years. By 2007, the total worldwide wireless population will exceed two billion subscribers.

A recent report issued by In-Stat/MDR finds that, although China continues to lead the world in overall subscriber growth, the new percentage growth leaders can be found in Southern Asia and Southeast Asia. "It is rather remarkable that the fastest numerically growing country, China, is trailing Africa, Eastern Europe and the Middle East in compound annual growth rate," says Ken Hyers, a senior analyst with In-Stat/MDR. "However, the fact that Western Europe and Scandinavia bring up the rear, as they did in previous 2002 to 2006 forecasts, should be no surprise." Indeed, In-Stat/MDR finds that Western Europe's growth virtually stops during the 2002–2007 forecast period, with a compounded annual growth rate of 1.2 percent. This statistic is hardly surprising in light of the fact that mobile phone penetration rate in 2007 will be 83.6 percent.

Meanwhile, research from Yankee Group, a Boston-based technology research company, shows that the U.S. wireless industry is approaching maturity with impressive speed. Only three years ago, the U.S. wireless industry was one of the few remaining emerging high-growth sectors. However, with almost 50 percent penetration, North Americans now treat wireless like a utility rather than a novelty.

"The U.S. wireless industry is facing the threat of becoming like the airline industry with high fixed costs, low variable costs, a perishable product and cutthroat competition," says Roger Entner, Yankee Group's wireless/mobile services program manager. "These conditions make it easy for industry participants to behave in a way that has potentially disastrous consequences

in the long run. Airline travel is cheaper than ever before, but few customers are happy with the experience."

Given the present state of wireless competition, it's only a matter of time before unlimited calling plans are available nationwide. Wireless number portability (WNP), which began in 2003, likely will be a catalyst for this trend, according to the research firm.

1.4 FOURTH-GENERATION MOBILE SERVICES

With the wireless industry looking for new ways of boosting both subscriber numbers and usage, most carriers are already planning fourth-generation (4G) networks. As a result, mobile phone networks are destined to become much faster and more uniform over the next several years. Today's networks, restricted by low bandwidth and a patchwork of incompatible standards, will give way to an interoperable system that supports an array of devices and offers seamless roaming. Imagine a wireless world in which networks provide broadband data and voice, giving users high-quality audio, Internet, and even video services. Users can go anywhere in the world and automatically be handed off to whatever wireless service is available, including cellular, satellite, and in-house phone systems.

Higher-speed third-generation (3G) mobile services has now rolled out, but 4G technology is waiting in the wings. Upcoming 4G services, intended to provide mobile data at rates of 100 Mbits per second or faster, could begin arriving as soon as 2006. According to the Fourth-Generation Mobile Forum, an international technical body that's focusing on next generation broadband wireless mobile communications, the technology is about to undergo explosive growth. In 2000, only eight organizations were involved in 4G research and development. In 2002, over 200 companies and research institutions were conducting 4G projects. By 2008, over $400 billion will be invested in 4G services.

Several major carriers have already started 4G testing. Japan's NTT DoCoMo, for example, has been conducting research on 4G mobile communications technology since 1998. In indoor experiments conducted in 2002, NTT DoCoMo's 4G system demonstrated maximum information bit rates of 100 Mbps for the downlink and 20 Mbps for the uplink.

Emerging 4G technology promises to converge wireless access, wireless mobile, wireless local area network (WLAN), and packet-division-multiplexed (PDM) networks. With PDM technology, for example, a single integrated terminal using a single global personal number can freely access any wireless air interface. Additionally, PDM radio transmission modules are fully software definable, reconfigurable, and programmable.

NTT DoCoMo is currently conducting research into a technology known as variable spreading factor-orthogonal frequency and code division multiplexing (SF-OFCDM), which has the power to transmit at speeds of up to

100 Mbps outdoors and up to 1 Gbps indoors. Basic functionality has already been verified for this technology and NTT DoCoMo is now involved in actual field experiments. The firm is also building a mobile IP network specifically for packet data that supports seamless service between the company's mobile service and a variety of other networks (such as WLANs) to provide an enhanced online experience with reduced network cost.

NTT DoCoMo is also working on an entirely new system concept that will have the power to do away with base stations entirely by allowing terminals to interconnect directly. This company is also investigating versatile mobile networks where base stations will have the ability to install themselves automatically to achieve a network that actually thinks for itself.

1.5 MODULAR COMPONENTS

As mobile operators race to provide ever more sophisticated and complex services, companies must soon redraw their IT architectures and adopt modular software components in order to market new services quickly and cheaply.

For example, many mobile operators find it hard to market their products quickly because of a complex and inflexible IT architecture that forces them to develop many parts of each new product almost from scratch. Product developers who can't reuse components across applications must constantly reinvent the wheel, asserts a study by McKinsey & Company, a management consulting firm based in New York.

Component reusability remains rare because speedy growth ruled the telecom industry during the boom years of the late 1990s, when companies had neither the time nor the inclination to consider which software components could be reused in other products. The quickest way to get out new offerings was to patch the existing architecture by forging connections between whatever systems immediately needed them. The result was an increasingly complex, spaghetti-like architecture littered with incompatible stand-alone systems. Such systems were based on software from a number of vendors and often using a variety of incompatible data formats, such as customer databases with different sets of vital statistics.

To illustrate the problem, the McKinsey report offers the example of a mobile device restaurant finder. An operator developing such a product starts by defining its characteristics, how to deliver the information to the subscriber (such as SMS, the Multimedia Messaging Service or the mobile Internet), and a pricing scheme. The programmers then work on creating the applications, databases, and interfaces. All of this makes for an arduous process, involving thousands of hours of coding and adding greatly to the project's cost.

Such a product also requires a variety of support features, including a restaurant database, customer profiles, and systems for locating and billing subscribers. Unfortunately, such features aren't always readily available. Infor-

mation about customers, for example, will almost certainly be spread over multiple databases and applications. Programmers may be able to access it, but they will need time to understand the code and data structures of legacy applications, as well as time to create interfaces to legacy databases and to combine and match customer information from many different sources. As a result, project's programmers will not focus on creating a differentiating customer experience but simply will focus on getting the basics right. "To begin constructing those support functions, mobile telecom companies should reorganize their information systems into reusable building blocks, or components," notes the McKinsey study. "Assembling and reassembling them into the basic elements of a mobile product then becomes a lot less time-consuming and costly."

There are multiple benefits to a component-oriented IT architecture, notes the McKinsey study. An architecture with reusable components would permit a team developing a mobile product to scroll through a company's database of services and to pick what it needed straight off the shelf or to tweak existing elements of the service. The team would then be free to concentrate on developing the product's features. "This approach, we believe, will become common in mobile telecommunications over the next few years," notes the study. "Judging by the results achieved in other industries, mobile operators could reduce the time to market of a new product by 30 percent and cut the cost of integrating it into an existing system by 60 to 70 percent."

1.6   A CONSIDERATE TELEPHONE

Besides allowing people to communicate in entirely new ways, emerging technology is also enabling individuals to interact with phone services in new and innovative ways. Telephones today, whether landline or wireless, are our cruel masters. They command our attention and don't care if we are eating dinner, engaged in a crucial business meeting, or watching a movie. But people may soon gain some control over their phones, thanks to pair of Carnegie Mellon University researchers who are working on a phone that could learn when—and when not—to summon its user.

The technology, which is being developed by researchers James Fogarty and Scott Hudson, utilizes tiny microphones, cameras, and touch sensors to monitor a phone user's activity level and body language. Software is used to monitor the various input devices and to determine whether the individual is too busy to bother with an incoming voice call or text message. "The idea is to get the telephone to act more as an assistant than a tool," says Fogarty, a Carnegie Mellon doctoral student.

Under one approach, the sensing infrastructure would be independent of the communications device but able to communicate with the unit. "You could instrument an office, for example," notes Fogarty. Homes, cars, and other locations could also be equipped with sensors to monitor their inhabitants' activ-

ities. An alternative approach would be to build the infrastructure, perhaps including a camera, microphone, and movement-detecting accelerometer, into the communications device itself. "That would probably be the least expensive approach," says Fogarty.

The researchers recently tested their technology, using 24 sensors, on four individuals engaged in work activities. The subjects were asked at random intervals, on a five-level scale ranging from "highly interruptible" to "highly not-interruptible"—how willing they were to be bothered with a phone call. The researchers then correlated the subjects' preferences with their behaviors.

Not surprisingly, the test showed that the subjects were least likely to appreciate an interruption while typing on a keyboard, talking on a phone, or speaking with someone else in the office. What did surprise Fogarty and Hudson, however, was the fact that the computer was slightly more accurate than human observers at predicting when an individual was willing to be interrupted. The computer successfully predicted the subject's preference 82 percent of time while humans managed only 77 percent accuracy.

Hudson believes that the test results will carry over successfully to the real world, particularly in business settings. "I'm confident that the results will apply to communications-oriented people such as managers," says Hudson a professor at the Carnegie Mellon Human-Computer Interaction Institute. Hudson admits, however, that he's not yet sure how well the technology will work with people in other types of jobs, as well as consumers. "I suspect that something slightly different will be needed, particularly for task-oriented workers," he says.

Fogarty and Hudson believe their technology could provide benefits beyond basic voice call convenience. The system could, for example, prioritize incoming instant messages based on the user's current activity—sending critical messages through immediately, delaying others to a more convenient time, and jettisoning spam. "Quite simple sensors will do the job," says Hudson.

The researchers first plan to integrate the technology into a computer-based instant messaging system. If that implementation proves successful, they will next target landline and wireless phones. "There's no technological roadblock that would prevent this technology from being deployed within a couple of years," says Hudson.

The researchers' ultimate goal is really quite simple, says Hudson. "We're out to prove that mother was right: it's not polite to interrupt while someone else is talking."

1.7 E-MAIL LEADS TO INSTANT MESSAGING

E-mail is a dominant data communications service, although its future is becoming less certain, due to rising spam and instant messaging usage. With more than 500 million business E-mail users worldwide today and over 20

billion spam messages expected to be sent daily worldwide by 2006, according to IDC statistics, the impact on business communications is huge.

IDC estimates that spam represents 32 percent of all external and internal e-mail sent on an average day in North America in 2003, up from 24 percent in 2002. The rising torrents of spam are reducing e-mail's usefulness by forcing users and IT staff to expend additional time and energy to identify, delete, and prevent spam from clogging in boxes. "To keep e-mail at the collaboration center stage, e-mail proponents will need to do a better job of helping end-users manage e-mail and use other collaborative tools in conjunction with e-mail," says Mark Levitt, research vice president for collaborative computing at IDC.

The value of instant messaging's immediacy and presence awareness is being noticed more widely in the workplace. However, instant messaging is becoming more similar to e-mail in terms of corporate requirements for tracking and archiving of messages.

Long favored by gossipy teenagers, instant messaging is now donning a suit and showing up for work. The software, popularized by programs such as AOL Instant Messenger, Microsoft's MSN Messenger, Yahoo Messenger, ICQ, and IRC, is being adopted—albeit often reluctantly—by a rapidly growing number of enterprises. "I think you're going to see IM use grow much faster than e-mail use," says Michael Osterman, president of Osterman Research, a technology research company in Black Diamond, Washington.

ComScore Networks, a Reston, Virginia-based audience ratings company, estimates that the number of work-based instant messaging users rose 10 percent during the first six months of 2002, reaching 17.4 million active users. "The same services that people have early-on adopted for use at home, mainly for social reasons, are now catching on at work," says Max Kalehoff, a senior manager at ComScore.

Unlike e-mail, instant messaging can deliver messages directly to a recipient's desktop, where it's likely to receive immediate attention. The technology can also be used for customer support and to simultaneously send messages to dozens or even thousands of users. With the arrival of instant messaging software into the business mainstream, many CIOs are concerned that instant messaging will open yet another door through which hackers can crawl. They also worry that instant messaging will sap productivity.

Despite the questions, instant messaging's popularity has drawn a variety of vendors into the field, with easily downloadable tools often appearing at enterprises that have yet to adopt a formal instant messaging strategy. "Most of the IMing at work is done through the big-brand instant messaging services," says Kalehoff. Osterman notes that enterprise adoption of instant messaging technology is lagging far behind employee demand. "Only about 30 percent of companies have established a corporate standard for IM," Osterman says. On the other hand, he notes, about 85 percent of companies have some level of instant messaging activity.

Capitalizing on the fact that their products already contain an instant messaging-type technology, conferencing and collaboration software vendors such as Groove Networks and Lotus Software are also entering the field. Lotus, which sells Sametime collaboration software, has already gained a solid foothold in the enterprise-grade instant messaging market. "Among organizations that have actually established a standard, about 60 percent have established Sametime as the standard," says Osterman. Unlike consumer instant messaging software, Sametime provides several enterprise-class management and security features, such as integration with corporate directories and encryption. Also entering the field are numerous pure-play instant messaging startups, such as Bantu, Ikimbo, and Jabber. These companies hope to beat the competition with instant messaging multimedia messaging tools that span multiple platforms.

The thought of employees flinging unencrypted messages through public networks, however, is enough to give almost any CIO the willies. The idea that external instant messaging senders may be able to toss viruses and other types of destructive code into an enterprise is at least equally chilling. Although most enterprise-grade instant messaging softwares offer some type of security mechanism, primarily encryption, many consumer-grade products—the kind brought in by employees without the IT department's knowledge—don't. "One of the problems with traditional consumer-grade clients is that they can open a hole in the firewall," says Osterman. "Then you have a path for viruses and malicious codes."

Compatibility problems also plague instant messaging; a universal standard is still somewhere in the future. Presently, most instant messaging products can't display messages from competing systems. "[AOL IM] is a popular service in some departments, and MSN is popular in other departments," says Kalehoff. "The problem is they don't talk to one another."

In addition to the security and compatibility traps of instant messaging, CIOs must also worry that the technology will eat into productivity. After all, repeatedly pausing to answer messages and swat nuisance IM pop-ups isn't a great way to focus. "You can specify that you're busy, but you have an extra step not to be disturbed," says Osterman. Employees are also likely to use the technology to chat with family and friends. "This is something that could be used as a time waster," says Osterman.

Many businesses also deal with IM's legal implications. This is particularly true in the financial industry, where Securities and Exchange Commission regulations require securities companies to record and log both instant messages and e-mails. Although most enterprise-grade instant messaging products, such as Sametime, provide archiving capabilities, many financial industry CIOs would simply prefer to skip the complex job of tracking individual instant messaging pop-ups. These CIOs have either banished instant messaging from their organization or limited its use to purely administrative functions. "We're not really communicating dollar figures or anything like that," says Robert Stabile,

senior technology officer at investment company J.P. Morgan Partners in New York City.

In fact, given the strong likelihood of technical and management headaches, CIOs at all sorts of organizations would simply like to exile instant messaging technology. Many already have. According to Osterman Research, 22 percent of companies block IM traffic from their network.

APL, a 12,000-employee containerized shipping company based in Oakland, California, put the hammer down on instant messaging when employees began installing consumer-grade client software on their desktop. "We started to see that it was eating up bandwidth; we started seeing file transfers via instant messaging," says Van Nguyen, APL's IT security director. After determining that instant messaging was more of a convenience tool than an essential business application, Nguyen and senior managers pulled the plug. "We have implemented a corporate-wide security policy to disallow instant messaging clients—period," he says.

Although banning client software is an easy way of dealing with instant messaging's problems, this move may also be shortsighted. Many enterprises that have adopted instant messaging are beginning to appreciate the technology's potential to actually boost productivity. Adopting a formal instant messaging strategy also lowers the likelihood that employees will sneak in less secure consumer-grade products.

When the employees at Avnet Computer Marketing want to send an important message to colleagues or customers, they don't necessarily reach for a phone or e-mail. More often than not, the information is typed into an instant messaging application. "You can just bounce a couple of lines across to somebody and get an answer," says Dave Stuttard, vice president of application solutions for the Tempe, Arizona-based computer products distributor.

At Avnet Computer Marketing, about 500 employees use instant messaging for a variety of tasks. In one pilot project, for example, customers can use instant messaging to contact technical people at the company. The software also reduces the need to place costly international phone calls. It's too early to tell just how much money instant messaging is saving, Stuttard says, but he's sure that the technology is having a positive effect on the bottom line. Stuttard says that, when all is said and done, the company hopes to reduce its number of voice mails and e-mails, while providing faster turnaround on decisions.

Instant messaging's cost savings potential hinges mostly on how the technology is used. "If it was used primarily as a replacement for long-distance calls," says Osterman, "then the savings in telephone charges could be substantial in a large organization." Similarly, if the technology serves as an e-mail replacement or supplement, "there could be some savings in disk storage and related requirements," he says.

As time goes by, even Nguyen is contemplating a return to instant messaging—but only under tightly controlled conditions. "We're looking to internal instant messaging servers," he says. APL's planned approach would place

instant messaging activities into an encrypted, VPN-type environment that would encompass only employees and selected external parties. "If it's a business requirement, definitely we would allow external partners to communicate with us," says Nguyen.

As instant messaging becomes a deeply ingrained technology, messaging functions are likely to begin popping up inside all sorts of business-oriented applications, ranging from word processors to accounting applications. "For example, you might see a future version of Microsoft Office that contains instant messaging functionality," says Osterman. (Houston-based Advanced Reality already offers tools for adding collaboration to any application.)

One possible Microsoft strategy would be to add instant messaging support to .Net Server, its latest server operating system. Code-named Greenwich, Microsoft's instant messaging software will provide a variety of multimedia tools to connect users in real-time. "Greenwich envisions building on core presence capabilities to deliver instant messaging, voice, video and data collaboration as a standards-based, extensible real-time communications solution," says Bob O'Brien, group product manager of Microsoft Windows .Net division. In the meantime, Yahoo has announced the release of its corporate instant messenger, which will include the capability to integrate with corporate directories and some applications.

Increasing enterprise adoption of instant messaging is also likely to lead to new uses for the technology. Avnet's system, for example, allows technicians to communicate with customers on particularly difficult problems. NEC Solutions' Visual Systems Division, an Itasca, Illinois-based display products vendor, is using instant messaging software to directly assist customers. "They can instant message their customer support rep and get the information they need instantaneously," says Fran Horner, director of the division's service sales group. The company's instant messaging system even has the ability to transmit diagnostic software and fixes directly to a user's desktop.

Ultimately, enterprise instant messaging will span an array of platforms, allowing users to conveniently contact people anytime, anywhere: on a desktop PC, personal disital assistant (PDA), mobile phone, or other connected device. Several vendors, including Bantu and Jabber, already provide software with a multiplatform capability.

1.8 FUN AND GAMES

Telecom services don't only carry voice and information. In the new Telecosmos, entertainment is an important diversion for telecom users and a profit center for service and content providers.

Wireless gaming is well on its way to becoming a mass-market phenomenon. Wireless games currently top the list of applications downloaded to cellular phones. IDC, a technology research firm located in Framingham, Massachusetts, expects the number of wireless gamers to grow from 7.9 percent of

all U.S. wireless subscribers in 2003 to 34.7 percent, or 65.2 million users, by 2008.

"In 2003, U.S. wireless carriers cleared a major hurdle in delivering wireless games to subscribers, demonstrating that wireless gaming is a viable business," says Dana Thorat, a senior research analyst in IDC's wireless and mobile communications service. "Carriers plan to aggressively promote wireless games to their subscribers while offering new line-ups of compelling titles, including those that support multiplayer and limited 3-rendering."

So far, carriers have pursued mass-market strategies in targeting games to a broad spectrum of consumer demographics. The key to wireless game success has been mostly related to strong brand and game title recognition. Popular wireless games in 2003 have included Jamdat's *Jamdat Bowling*, Activision's *Tony Hawk's Pro Skater*, Eidos' *Lara Croft Tomb Raider*, and Gamelofts' *Tom Clancy's Splinter Cell.*

For the carriers, getting to market quickly with compelling game titles is the key to unlocking the new revenue opportunities of wireless gaming. The growth of this market will not only depend on the infusion of download-capable handsets but also more effective merchandizing, such as recommendation engines, opt-in e-mail, and five-digit short code marketing, as well as various upselling and cross-selling techniques using other mediums such as banner ads on online game sites.

1.9 FLYING PHONE SERVICE

Talking on a mobile phone while flying on a commercial airliner could soon become reality, at least if one company has its way. AirCell has developed a technology that would allow mobile phone users to place and receive calls as if they were still on the ground. The system uses airliner-mounted radio transceivers to connect callers with any of 135 antenna sites across the U.S. The company was awarded a U.S. patent for its technology last month.

Compared with earlier technologies, which involved placing the equivalent of a full terrestrial mobile phone base station aboard an aircraft, AirCell's approach reduces the size, weight, and cost of equipment required to provide phone service on board an aircraft. "The patented concepts allow all the functionality provided to the cellular user in-flight to be controlled by the network rather than the airborne station, simplifying the addition of features and migration to future cellular technologies, and it also provides a novel way to manage the radio frequency environment in the aircraft to prevent interference," says Ken Jochim, vice president of engineering and operations for the Louisville, Colorado-based company.

The company notes that rigorous testing will be required to satisfy concerns relating to possible interference with the aircraft's communication and navigation systems. AirCell says it has entered into discussions with the FCC and FAA to ensure all requirements are properly met.

Although airlines are reluctant to admit the fact, an unknown percentage of passengers actually do use their mobile phones—albeit stealthily—while flying. "Many passengers use their Blackberry devices on planes as well," says Edward Rerisi, an analyst at research firm ABI. "These technologies work, but coverage is often spotty and the exact effects on the aircraft's communications are still unproven."

Flying phone users can also wreck havoc on terrestrial base stations. "When airborne, a single mobile handset may be able to transmit to multiple base stations," says Rerisi. "This poses a particularly challenging problem with CDMA networks, but reportedly less so with TDMA, GSM and analog networks."

Although AirCell's technology addresses the technical challenges posed by airborne mobile phone use, the company has yet to unveil the system's business model. "Billing will be a challenge," predicts Rerisi. "What about pricing plans? Surely the airlines will want to share in the revenues garnered during in-flight calls."

AirCell states that it is working toward getting its technology certified for commercial air transport aircraft and that discussions are in process with several airlines to finalize plans for a trial program. Rerisi describes AirCell's system as a "plausible" technology, although "regulatory and business challenges may prevent the technology from leaving the ground."

1.10   SPEECH INTEGRATION

Speech integration is the technology that adds voice services to enterprise phone systems and Web sites. The speech recognition market has suffered along with the entire telecommunications industry during the past few years, but the market now appears to be poised for renewed growth. "There are several signs that the speech recognition industry is maturing," says Steve Cramoysan, a principal analyst with Gartner, a technology research firm located in Stamford, Connecticut. Many implementations provide proof that solutions that use speech recognition can deliver business value, as cost savings or improved customer service."

Speech recognition performance has improved versus the products available only a couple of years ago. As a result, it's becoming increasingly difficult for vendors to differentiate their wares purely on the basis of speech recognition success rates. Internet-based applications and standards, such as VoiceXML, are gaining market share, providing an increasingly distributed architecture that allows companies to leverage their investment in speech technology and allows services providers to offer speech recognition services to enterprises. "The clear market leaders today are Nuance and ScanSoft. Entry by Microsoft, IBM, and Intel into the market is providing significant momentum, and further changes in the vendor landscape are to be expected," notes Cramoysan.

Perhaps the most important use of speech recognition technology over the next several years will be in speech integration systems that automate and streamline enterprise phone systems. Speech integration technology is nothing new, as any telephone caller who has ever barked back responses to a seemingly endless series of voice prompts can testify. But an improved generation of speech integration software, based on more powerful processors and emerging Internet-focused standards, promises to make the technology more useful and cost effective.

Until recently, organizations tended to shy away from speech integration because of the technology's complexity and cost. "I had one client who had 60 people on its [speech integration] project," says Elizabeth Ussher, an analyst who covers speech technologies for Meta Group, a technology research firm located in Stamford, Connecticut. Today, preconfigured speech templates, drop-in objects, and other packaged tools make speech integration development less burdensome. Hardware improvements, particularly speedier processors, also help make speech integration a more practical technology. "Speech recognition is now very widely deployable," says Ussher. "I'm seeing clients with a return on their investment within three to six months."

Yet another reason for increased interest in enterprise speech integration can be found in the almost exponential proliferation of mobile phones, PDAs, and other portable wireless devices. Speech input/output is an attractive alternative to cramped keyboards and miniscule displays. "If I'm on my mobile phone while driving my car, I'm not going to push buttons for my account number," says Ussher. "I'm going to wait for an agent—living or virtual."

Dollar Thrifty has been using speech integration to handle some of the more than 1 million calls it receives each year from "rate shoppers"—bargain hunters who phone several different car rental companies in search of the best deal. "Many of the folks who call are just interested in checking rates," says Bob Dupont, vice president of reservations for Thrifty. "They aren't interested in making a reservation; they just want to get information for comparison purposes."

To free its call center staff from the burden of handling routine data lookups, Dollar Thrifty installed SpeechWorks International's software at its Thrifty division. The system lets callers check rental rates and availability at airport locations by talking with a virtual call center agent. "It's a very natural, realistic interchange," says DuPont. The software also automatically adapts to unique requirements, such as providing personalized rates for members of Thrifty's loyalty program.

After checking rates and availability, callers who decide to make a reservation are seamlessly transferred to a live agent. A screen "pop" automatically appears on the agent's display, presenting all the information the caller provided during the speech interface dialogue. DuPont estimates that 35 percent of calls to the company's toll-free number go through the speech integration system. In addition, speech integration has not hurt Thrifty's conversion rate— the number of people calling for a quote who ultimately make a reservation.

Deploying the system wasn't especially difficult, he adds. "Just the normal tweaking of the application and getting the voice recognizer to work better. Once we got through the first 90 to 120 days, it became apparent that we had a very solid application." Uptime has been more than 99 percent, which is a critical factor, says DuPont. "If it were to go down, we certainly would be understaffed."

Enterprises looking into speech integration face two basic technology choices. The oldest and simplest type of speech integration—"directed dialogue" products—prompts callers with a series of questions and recognizes only a limited number of responses, such as "yes" and "no," specific names, and numbers. A new and more sophisticated approach—"natural language"—to speech integration handles complete sentences and aims to engage callers in lifelike banter with a virtual call center agent. The technology is also more forgiving of word usage. "If a customer calls Thrifty and asks about rates from JFK Airport in New York, they might say 'JFK' or 'John F. Kennedy' or 'Kennedy Airport,'" says SpeechWorks cofounder and CTO Michael Phillips. "The system has to be prepared for the different variations that might be used."

Directed dialogue tools, although less expensive than natural language systems, suffer from their limited recognition capabilities. As a result, they are mostly used for simple applications, such as automated switchboard attendants or credit card activators. Natural language systems, such as the type used by Dollar Thrifty, have a wide range of applications, including product and service ordering, telebanking, and travel reservation booking.

A pair of emerging technologies—VoiceXML and Speech Application Language Tags (SALT)—are also helping to advance voice integration. Both rely on Web technology to make it easier to develop and deploy speech integration applications. VoiceXML is an XML extension for creating telephone-based, speech-user interfaces. VoiceXML lets developers create directed dialogue speech systems that recognize specific words and phrases, such as names and numbers. That style of interface is well suited to callers who have no screen from which to select options. SALT, on the other hand, provides extensions to commonly used Web-based markup languages, principally HTML and XHTML. It makes such applications accessible from GUI-based devices, including PCs and PDAs. A user, for example, might click on an icon and say, "Show me the flights from San Francisco to Boston after 7 p.m. on Saturday," and the browser will display the flights. Both specifications aim to help developers create speech interfaces using familiar techniques. "You don't have to reinvent the wheel and program a new interface to get speech recognition access to your data," says Brian Strachman, a speech recognition analyst at technology research company In-Stat/MDR.

Although most people think of speech integration in terms of customer self-service, the technology can also be used internally to connect an enterprise's employees and business partners to critical information. Aircraft mechanics, for example, can use speech integration to call up technical data onto a PDA

or notebook screen. Likewise, inventory takers can enter data directly into databases via speech-enabled PDAs, without ever using their hands. The Bank of New York, for example, has tied speech recognition into its phone directory and human resources systems. Using technology supplied by Phonetic Systems, the bank operates an automated voice attendant that lets callers connect to a specific employee simply by speaking that person's name. However, in the event of a major emergency that requires entire departments to move to a new location, the employees can call into the system to instantly create updated contact information. The information then becomes available to anyone calling the bank's attendant.

The speech-based approach is designed to help bank employees resume their work as soon as possible, even before they have access to computers. "The automated attendant was already connected to our back-end systems," says Jeffrey Kuhn, senior vice president of business continuity and planning. "We simply expanded the number of data fields that are shared between the Phonetic's product, our HR system and our phone directory system." The biggest challenge Kuhn faced in deploying the technology was getting it to mesh with the bank's older analog PBX systems. That problem was eventually solved, although the interface ports on the old PBX units must now be manually set, which is a minor inconvenience.

Speech integration's primary benefit for callers is convenience, since the technology eliminates the need to wait for a live agent. Problems handling foreign accents, minor speech impediments, and quirky word pronunciations have largely faded away because software developers have given their products the capability to recognize and match a wider array of voice types. "Every four to five years, speech technologies improve by a factor of two," says Kai-Fu Lee, vice president of Microsoft Speech Technologies. Dollar Thrifty's DuPont says his company's internal research has found an end user satisfaction level of around 93 percent. "It either met or exceeded their need to get information, and they had an improved perception of our company," he says.

For enterprises, speech integration's bottom-line benefits include cheaper user support and data access. DuPont says his system paid for itself in less than one year, lopping about 45 cents off the cost of each incoming call for Thrifty. Bank of New York's Kuhn estimates that his system handles the work of five full-time employees. Still, despite the potential benefits, enterprises shouldn't view speech integration as a panacea to their rising call center costs. The technology itself requires constant attention, which adds to its base cost and detracts from potential savings. "It's labor intensive," says Meta Group's Ussher. "It's not like a washing machine that runs on its own. It's a technology that requires constant tweaking, pushing and updating." DuPont warns potential users not to consider speech integration as solely an IT issue. Because the technology affects a wide range of business processes, he believes that it's vital to garner enterprise-wide support. "I would certainly recommend getting all the stakeholders involved," he says. "When we put our system

together, we involved people from many disciplines, including IT, HR, finance and telecom, as well as the reservations group."

Although speech integration will certainly become more capable and self-sufficient in the years ahead, few observers believe the technology will ever fully replace living, breathing call center agents. In-Stat/MDR's Strachman says that speech integration will primarily be used to eliminate call center grunt work, such as the recitation of fares and schedules, and to give end users a new way to access critical data. The handling of complex issues, such as technical support, will probably always require access to a live expert. "For call center agents to stay employed, they're going to have to be more highly skilled and trained than they are now," says Strachman.

1.11 TELEMEDICINE

New telecom service, hardware, and software options are opening the door to advanced video and data monitoring capabilities. The health care industry is leading the way in using these technologies to address real world problems. For example, research shows that substituting interactive video sessions for up to half of a visiting nurse's in-home meetings with postsurgical or chronically ill patients can be a cost effective way to provide care.

"Video visits are not a complete substitute for in-home nursing care," says Kathryn Dansky, a Penn State University associate professor of health policy and administration. "You are always going to need home visits because patients benefit from the personal touch." Still, a recent study led by Dansky found that, over a typical 60 days of care, savings of $300 per patient could be achieved by substituting video visits for seven in-home visits and $700 per patient was saved if half of the visits were made via advanced communication technology. "As the number of nursing visits increase, you can substitute more and more video visits if the purpose is to monitor the patient's health status," says Dansky. "Substituting an equal number of video and home visits can produce a major difference in the cost of the care." The sources of savings include less travel time and travel costs, fewer travel accidents, less car theft, and the ability to see more patients in the same amount of time.

Skilled nursing care in the home requires a registered nurse to drive to the patient's residence, conduct examinations and assessments, provide patient care and education, and then drive to the next patient's house. The process is time consuming, dangerous at times for the nurse, and expensive. To see whether new technology could help both patients and nurses without incurring additional costs, the researchers initiated a 24-month evaluation of the use of telecom as a supplement to skilled nursing visits for people with diabetes. Called the TeleHomecare Project, the effort was a partnership of Penn State, American Telecare Inc., and the Visiting Nurses Association of Greater Philadelphia (VNAGP), a large, urban, home health agency.

A group of 171 diabetic patients discharged from the hospital and referred to the VNAGP participated in the study. Half of them were randomly assigned to receive a patient telecommunication station in their homes, while the remaining patients received traditional in-home nursing visits. The patient station included a computer and monitor equipped with two-way voice capability and a video camera. A blood pressure cuff and stethoscope were also attached to the computer.

Using the patient station, which works over ordinary phone lines, the patient could see and talk with the nurses. The system also allowed the nurses to see and hear the patients and to take temperature and blood pressure measurements, listen to heart and lung sounds, and discuss diet and blood sugar results. Patients who used the telecommunications system scored higher on positive outcomes of treatment, had fewer rehospitalizations, and had fewer visits to hospital emergency rooms.

Dansky notes that, in general, the patients liked working with the telecommunications equipment. The stations gave patients a sense of security because they could keep in touch with their nurse at all times. Some patients even prepared for the video visits by fixing their hair and dressing up. Far from frivolous, such interest in self-care is an important indicator of vitality and personal responsibility.

The nurses, too, responded favorably to the technology, although three generations of telehomecare machines were introduced and tested during the study period. Dansky notes that the nurses found ingenious ways to deal with equipment failures. For example, if a patient didn't respond, they would hold up a sign that says, "Nod your head if you can see and not hear me." The nurses also used laundry baskets to take the equipment into homes so that thieves wouldn't see what they were doing. There were no thefts during the project and no break-ins, even though some patients resided in crime-ridden areas of the city.

Dansky sees many possibilities for broader application of the telecommunications systems. She is currently working with Sun HomeHealth to study whether the systems can aid nurses in helping patients manage their medications, especially when there is a danger of drug interactions. She also sees the possibility of physical therapists using the system to supervise family members or aides helping patients exercise in their homes. Dieticians could also use the system to supervise meal planning and preparation.

1.11.1 Health Monitoring

Sophisticated health monitoring services are beginning to allow patients to receive quality health care even while at home. Companies like Philips Medical Systems are pioneering this field. Philips and HomMed have one objective, although their approaches to in-home health monitoring are different. HomMed's system is fully wireless, whereas Philips offers a combination wireless-and-wireline configuration.

With HomMed's system, a portable instrument console sits in a patient's bedroom or similarly convenient place. The unit accepts plug-in measurement devices that collect patient health data, such as heart rate, blood glucose levels, and body temperature. The information is sent via the SkyTel pager network to a central station located at a hospital or a clinic where a clinician reviews it. A wireline connection is available as a backup.

A key reason that HomMed is using wireless technology is that one of every eight patients doesn't have a home phone, according to HomMed CEO Herschel Peddicord. He also cites the technology's portability as a plus. "HomMed's system can be taken on the road and used in a hotel room or a vacation home, which is particularly handy for elderly patients who travel to winter homes," he says.

HomMed is confident that wireless is the best way to move patient data from homes to clinicians; however, Philips says the combination wireless-and-wireline approach of its heart-care system is less expensive and more reliable and secure. "Phone lines are highly dependable, service is universal, and we don't have to reassure people that their data won't be intercepted by electronic eavesdroppers," says Steve DeCoste, business manager for Philips Medical Systems.

Critically ill heart patients usually don't travel much, DeCoste notes, so there isn't a great demand for portability. "We're not after that diabetic who's 25 years old and still rides his mountain bike," he says. Philips' system, which the company acquired last summer from Agilent Technologies Inc., uses battery-operated wireless measurement devices, such as weight scales and blood-pressure cuffs, that can be placed anywhere in a patient's home. "Since our patients tend to be very sick, it's important for the devices to be easily accessible at a bedside or other convenient location," DeCoste says.

The wireless devices allow patients to gather measurements daily—such as weight, blood pressure, pulse, and heart rhythm—that are vital to the ongoing management of congestive heart failure. The data are transmitted to a hub box, which collects the information and automatically sends it via a phone line to a clinician for examination.

1.11.2 Small Clinics/Hospitals

Monitoring patients after they have left the hospital is a vital part of follow-up care. Yet many small clinics and hospitals find it difficult to provide adequate outpatient support, primarily due to distance and budgetary limitations.

A new software package aims to give small institutions the technical means to improve outpatient follow-up by accessing servers located at larger hospitals. Using the software, small clinics and hospitals can access and use the data held by larger institutions to better track patients' medical and nutritional care and to set up automated prescription services.

Sponsored by EUREKA, the pan-European research and development consortium, the software is focused on nutritional follow-up. The technology

can be used to monitor children with diabetes or other illnesses that require careful diet monitoring. For children with diabetes, the software can help minimize long-term complications, such as damage to the eyes, nerves, and kidneys.

"Nutrition is of critical importance for certain patients," says Bernard d'Oriano, managing director of Fichier Selection Informatique, the French company that's leading the project. Careful nutrition monitoring is also crucial because of Europe's rapidly aging population. "Elderly people can become malnourished very quickly, even if they are still eating, and can become critically ill within the space of three weeks," notes d'Oriano. Using the new software, a doctor could alert the hospital whenever they suspect a patient is in danger, and the hospital could help monitor the person's diet.

A companion software package allows doctors to send prescription orders electronically. "The doctor at the patient's bedside enters the prescription onto a laptop or a PDA and sends it via the Internet directly to the hospital's in-house pharmacy," explains Philippe Corteil, managing director of the venture's Belgian partner, Medical Business Channel. The pharmacy can then instantly dispense the medicine and keep an accurate account of both what is going to the patient and the stock remaining in the pharmacy. Simultaneously, the software enables the prescribing doctor to see what other pharmaceuticals have been prescribed for the patient and to be alerted if there is a potential medicine conflict.

For d'Oriano, joining the EUREKA project was advantageous in several ways. "Above all, it brought me the means—a loan as well as a Belgian technical partner with whom we were able to work—and a certain reputation and recognition," he says.

1.11.3   Monitoring on the Road

In California's Santa Cruz County, all of the ambulances have been equipped with cardiac monitors that send vital data directly by mobile phone to the emergency department of the closest receiving hospital. The system has been created to test a new strategy, devised by University of California-San Francisco (UCSF) researchers, that aims to speed treatment for heart attack patients.

In mountainous Santa Cruz County, ambulance runs are often lengthy. "Every minute that heart cells are deprived of blood flow, they are dying," says Barbara Drew, the study's principal investigator and a professor of physiological nursing in UCSF's School of Nursing. "Once heart cells are dead, they don't regenerate. So the initial treatment goal is to get the blockage in the obstructed artery open as quickly as possible before any more heart cells die."

The new "tele-electrocardiography" system consists of a cardiac monitor that takes readings every 30 seconds and can detect ischemia, the diminished flow of blood through an artery that signals heart damage. The unit is hooked to a mobile phone that transmits vital information directly to the emergency

department of the receiving hospital. Drew based the device on her years of experience in cardiac intensive care unit. "Usually when patients arrive at a hospital, they are evaluated by a triage nurse," says Drew. "If their condition warrants it, they are attached to a cardiac monitor for further evaluation. But all that takes time. What we wanted to do was to move the clinical decision-making to a point before the patient even gets to the hospital."

The standard heart-monitoring procedure used by medics who respond to calls from people experiencing heart attack symptoms involves attaching a cardiac monitor with a single recording lead to the patient's chest. The monitor provides only a basic electrocardiogram (ECG) that measures the patient's heart rate and rhythm. The unit can't detect ischemia. Some ambulances in the United States are equipped with 12-lead cardiac monitors. Although these can detect ischemia, they require the attachment of 10 separate electrodes to the patient's chest and they make only a single 10-second recording, which may miss rapidly changing abnormalities common in heart attacks.

The "tele-electrocardiography" system Drew is using in her study consists of several components, including a 12-lead cardiac monitor that requires only five electrode attachments to the patient's chest. Another key component is software that analyzes the ECG every 30 seconds for signs of ischemia and heart damage. Once patients are attached to the monitor, ambulance medics push a button to send the first reading to an emergency department computer. An audible alert accompanies the transmission. If the software detects changes in subsequent ECGs, it automatically transmits them, as well.

Drew chose Santa Cruz County as a testing ground for the system because the county is large and mountainous and has only two hospitals, both located near the coast. For many residents, hospital transit times are long. "If hospital teams had advance notice of the patient's condition, it would give them time to get ready for immediate treatment," says Drew.

Drew and her researchers are now studying the impact that the mobile phone-delivered heart data is having on patients. Drew says it will take five years and the enrollment of hundreds of patients to determine whether the system is worth the cost. "It would be irresponsible to spend the money necessary to equip thousands of ambulances with the system unless it can be shown that, overall, outcomes such as better long-term health and survival are improved," says Drew.

Although telemedicine has enabled greater access to health services, the potential communication problems it brings could interfere with the technology's potential to improve the diagnosing and treating of illness.

Telemedicine is certainly valuable for delivering health- related services to remote areas, but the dynamics of the interactions associated with it can increase the likelihood of uncertainty, frustration, and unmet expectations for all involved, says Richard L. Street, a health communication authority at Texas A&M University.

Street, working with the Texas Tech University telemedicine program, has analyzed teleconsultations involving videoconferencing between a patient and

primary care giver at one location and a specialist at another to identify patterns of talk that could affect quality of care. Although the teleconsultation may allow the specialist and primary care provider to exchange information and ideas, such a teleconsultation may restrict patient involvement in the encounter, he says. "While patients usually account for about 40 percent of the talk occurring in traditional consultations, they account for only 23 percent in teleconsultations," he notes.

Patients rarely asked questions or asserted a perspective or an opinion—something less than ideal considering how much a patient interacts with his or her doctor can have profound effects on diagnosis, treatment, and even health improvement, Street says. Patients who actively participate in consultations with their physicians, he explains, receive a greater amount of information, understand the issues better and are more satisfied with their care—all of which make for an overall improved quality of care.

Not only can patient participation affect the quality of a visit to the doctor, but a growing body of research indicates that it can contribute to improved health and healthier behavior, Street adds. Limited patient participation may be due to several factors, he notes.

The presence of an additional medical expert may unintentionally limit patient involvement as the two physicians converse with one another about the case, he says. Street also points to cultural and demographic variables, noting that patients who are more involved in their consultations tend to have more formal education and be in the middle to upper income bracket. However, people in remote, rural areas who are likely to have telemedicine encounters tend to be poorer and have less formal education compared with their urban and suburban counterparts.

Street also notes that very little group discussion takes place in these encounters, possibly due to the actual construct of the encounter, which places the patient and primary care giver side by side, facing a monitor with the specialist as their visual focal point. Additionally, linguistic differences play a factor. Street says clinicians often share a specialized linguistic code that allows them to better communicate but comes across as difficult to understand medical jargon to the patient.

Street recommends that the benefits of doctors being able to talk with each other can be further enhanced if they give patients more opportunities to speak by using partnership-building methods like asking for the patient's opinion and other patient-centered responses, such as offering encouragement and showing concern and interest in the patient. "These communication strategies would both legitimize and effectively increase patient participation in these encounters," he says.