

## CHAPTER TWO

# The Connectivity Divide

Let's start with a simple test. Draw a line under the last question to which you can answer yes.

- |                 |                                                                        |
|-----------------|------------------------------------------------------------------------|
| <b>Toddler</b>  | I sometimes receive postal mail.                                       |
|                 | I have a home phone.                                                   |
|                 | I have cable TV at home (or satellite).                                |
|                 | My home phone is cordless.                                             |
|                 | I use the Internet from home.                                          |
|                 | I have at least one cell phone.                                        |
|                 | I use e-mail for either work or family matters from home.              |
| <b>Crossing</b> | I have high-speed Internet (cable or DSL) at home.                     |
|                 | I use instant messaging either at home or work.                        |
|                 | I sometimes work from home instead of going into the office.           |
|                 | I carry my cell phone wherever I carry my wallet.                      |
|                 | I use text messaging (via cell or PDA).                                |
|                 | I usually pay (if necessary) at hotels for high-speed Internet access. |

**Connected** I could make use of an XML document if I wanted.  
I use a hybrid PDA (cell, e-mail, text services).  
I use “virtual office” groupware tools (document sharing, messaging).  
I sometimes work at 3:30 in the morning.  
I expect airports, campgrounds, rest stops, trains, buses, and planes to have WiFi service. Actually, I expect it absolutely everywhere.  
I sometimes make free voice calls over the Internet.  
I usually work from home and have given up my true office.

There is a dividing line between the truly connected members of our society and those who are not. The value of Inescapable Data technologies can only be realized by crossing the line. In 2005, most career-oriented adults fall somewhere between being connected newborns to having advanced to the toddler stage. Teens and twenty-somethings, the future workforce, are another story. They are showing their parents the way.

## Introduction

“There is a way in which technology is inexorable, so I doubt there is a way to stop any of this,” explains Dr. Nicholas Christakis, notable Harvard University sociologist. “Is there a socioeconomic class getting left behind? Sometimes, technology improves standards of living, and sometimes, it increases the difference between the top and the bottom. Regarding data and connectivity, like the washing machine and dishwasher benefits, we’re all better off. Sure, there is still a difference between the top and the bottom, but the fundamental benefits are realized by all. We all drive cars; some drive Mercedes and some drive Hyundais, but we all get places.”

Inescapable Data and the value of connectivity will be available to everyone, eventually. We may cross into the competence zone at different times and with varying degrees of sophistication with regard to the use of our new “toys.” As we approach the middle years of the first decade of the twenty-first century, the main issue will be building the wireless “information” infrastructure, much as the main issue of the early 1990s was building the Internet infrastructure. Here, we examine the status and future of the great wireless build-out, because only when that is fully in place can society as a whole cross the connectivity divide.

## Wireless and WiFi: From Confusion and Competition to Possible Synergy

Steve Nicolle, CEO of Tatara Systems, a company focused on the convergence of cellular services and wireless Ethernet (WiFi) once overheard a CTO of an unnamed wireless carrier say of WiFi, "If I could squash it, I would." Things are moving quickly in the wireless communications industry, and confused consumers are having trouble keeping up with the torrid pace. A clear understanding of the major communication denominations is definitely needed. What the average consumer thinks of as "cell service" is more broadly termed "wireless" (not to be confused with "cordless," as in cordless phones, and definitely not to be confused with WiFi or 802.11)—three commonly used "wire-free" communications methods based on three different technologies—confusion right off the bat.

Many wireless carriers, such as AT&T and Verizon (once known as New England Telephone), have been around since the days of the Bell network, huge long-distance phone bills, and POTS (plain old telephone service). Others such as Sprint are relative newcomers. Carriers actually "carry" voice and data over long distances and comprise the Internet backbones (appropriate given their wireline history and the Internet's continuing dependence on wired communications). Carriers owned what was once known as the "Iron Triangle"—the phones, the network, and the support services—a comfortable situation that is now limiting broader user adoption. The Iron Triangle carriers hold the keys to introducing new cell-based applications that we believe would attract even more users. However, they have tended to lock out the smaller more aggressive players offering more advanced and creative applications. Fortunately, times are changing.

"Wireless Ethernet (WiFi, or often called 802.11) put a wedge in that triangle," explains Nicolle. "Wireless Ethernet devices are made by typical computer communication companies such as Cisco. All was well when WiFi was an in-office-only technology because the cellular wireless carriers never serviced that computer end user. This is now all changing as a result of cell phones that have data services making them more computer-like and computers having cell capabilities making them far more portable." The confusion and competition begins.

The cellular wireless carriers have had to upgrade their communications technologies to better deal with data. (For example, voice traffic places less demand on a network for communications bandwidth than data.) Early cell-data services offered approximately 64 kbps (kilobits per second) connections to the network, not too unlike the old 56 kbps dialup modems of the early Internet

days. However, you got 64 kbps if no one else was using the wireless service at the same time. Bandwidth is shared among all active users in a particular cell zone, so actual data communication rates could be closer to 1 kbps—nearly impractical for any serious data use.

The cellular services carriers are not sitting idly by, however. New technology is being rolled out now that greatly increases data communications rates. Not one, but two entirely different and competing high-bandwidth wireless communications technologies are now in use: Code Division Multiple Access (CDMA) and Global System for Mobile Communications (GSM). CDMA is more prevalent in the United States and is carried by Verizon and Sprint. Although GSM's penetration of the U.S. market is reasonably large (by virtue of the fact that it is carried by AT&T and Cingular), it is virtually the only technology outside of the United States.

Unfortunately, the technologies are incompatible. Proponents of either standard push roadmaps along that reflect parallel visions, yet never is convergence of the two competing standards foreseen. This echoes the early days of local-area network (LAN) data communications, which began with three LAN technologies (Token Ring, Ethernet, and AppleTalk). However, the marketplace eventually settled on Ethernet. So now, all computers that use wireless Ethernet are derived from one family, 802.11, where one finds a more or less smooth path of technological advancement waiting ahead.

The cellular wireless carriers are heading toward a new generation of technology known as 3G (third generation), which will boost wireless data speeds into the multimegabit per second range and higher—still shared among many other members of a cell site that could be physically large compared to a section of an office building or home. Although the cellular carriers might fantasize about 3G's potential as being *the* communication technology to the end point, that is likely too impractical of a scenario.

Too often, wireless-enabled laptop computers (and other endpoint devices) will be useable within distance of WiFi access points that will offer data rates that are far in excess of what can be experienced by sharing a 3G connection with potentially hundreds of other users. Because users will always clamor for the higher speed and will only tolerate lower speeds as a last resort (such as at the beach, on a mountain, or on the highway), we will probably see a combination of wireless communications standards going forward. "The cellular wireless carriers are finally embracing the notion of working with the WiFi camps because it is now the same end-point customer," explains Nicolle. One of net effects of the Inescapable Data world is that the business user and the citizen

share the same technology needs. “Furthermore, the carriers have a critical piece—the backbone infrastructure. Wireless Ethernet still has to ultimately hit the Internet and that ‘backhaul’ interface is expensive.”

#### **Travel Notes from a Connected Cognoscenti**

Although I always prefer WiFi when possible, I am truly grateful to have the slower cellular “data” services to keep me connected in between. Recently, I vacationed in St. John, U.S. Virgin Islands, with my family. One beautiful day we rented a rubber “dingy” and motored halfway to St. Thomas. We dropped anchor to eat lunch while bobbing in the waves. (The anchor, of course, did no good because the water was too deep, but the effect was comforting.) While sitting on the edge of the dingy (which is how one sits when in a dingy), I was happily e-mailing two customers that had a technical problem and updating our family relatives regarding our current boating adventure. After a soggy sandwich, I surfed various Web reviews to settle on a restaurant for the evening (all from my PDA). We then motored back and jumped the boat across many turbulent but exhilarating waves. Having *any* sort of data access in uncommon places is fantastic—speed merely improves the experience.

In the end, we as consumers will win. In the meantime, there is confusion over what standards we should adopt and some spotty service. The BlackBerry, for example, uses cellular, and although it is somewhat slow for Internet surfing, connectivity is ubiquitously available no matter where one is, and the data rates are perfectly practical for e-mail and text messaging. Laptop computers with nearly gigabit WiFi work fine in key locations such as at home or in the office (or even better, in the home office); in fringe locations such as campgrounds or airports, however, one can be forced to pay separately for access via some other service provider or have no access at all. Although wireless communication may seem more or less pervasive, connectivity is not yet ever-present—a temporary barrier to an absolute Inescapable Data world and wide-scale connectivity for us all.

## Nokia and DoCoMo Versus the Old Guard

Mike Hill, general manager of IBM's Global Communications business, described for us the changing climate in the wireless carrier space. "Voice revenues (as an application) are declining as far as the price point, but the volumes are going up. Cell companies have to continue to provide voice services, but the costs for providing them are increasing. How will they recover that revenue and grow? By offering new applications, most telcos are gearing themselves up for this new opportunity landscape." A market that has more than 170 million subscribers in the United States alone—nearly every American adult—is an attractive market opportunity for additional services.

But it's not so straightforward. First, there are two competing approaches. Some device manufacturers, such as Nokia, want to build more intelligent devices that run a number of applications locally (i.e., with much of the application processing done by the cellular device or PDA itself). The other camp favors a "thin-client" model with minimal processing at the consumer end of the connection and more processing at the service provider end, resulting in lighter-weight (and cheaper) handheld devices. "We've seen such pendulum swings many times in the regular computer industry. Typically, as speed and ubiquity of communication infrastructure increases, services migrate back to the center and allow for thinner clients. We're seeing wireless speeds and coverage soar, so we're likely heading for service provider services," extols Hill.

### Electronic Jack Knives

Our cell phones are rapidly turning into "everything" devices. Candide Media Works ([www.candidemedia.com](http://www.candidemedia.com)) offers a service called Talking Street ([www.talkingstreet.com](http://www.talkingstreet.com)). For a few dollars, Candide takes you on a pay-per-use walking tour of city sites that would be of interest to you as a tourist, hosted via your cell phone. Dial in to an interactive walking tour; then, as you roam around to various landmarks, pressing different keys activates recordings of scenic details and history. Listen to the tour at your own pace (asynchronously) over the course of a week if you want. Candide Media currently uses celebrities such as Sigourney Weaver or Steven Tyler as the narrators and is appearing in various cities around the United States (Boston, New York City, and Washington, D.C. so far, with more to come).

One could imagine that PDA-cellular devices could augment such a tour with pictures and short video clips. A GPS-enabled device could perhaps guide you along a path during the tour as well. Perhaps even an RFID reader in the phone could detect specific objects in the area and activate recordings for additional details.

Cell phones can also be used as a payment device for services and products; NTT's DoCoMo phones can now be used for retail purchases simply by waving the phone at the checkout in some locations. Such a phone can also be used as a "wireless key" to allow entry into your house or office or admission to a movie. Going forward, it appears that our cell phones (or PDAs) will become our electronic jack knives.

Hill goes on to explain that the adoption rate of any new cellular service is highly dependent on availability of a wide range of extremely easy-to-use applications available for it. We saw that the success of the PC in the 1980s was driven largely by the broad availability of applications made possible by Microsoft's development model, which encouraged a multitude of small software companies to write application software specifically for MS-DOS first and Windows later on (far unlike Microsoft's rivals of the period). However, playing out a similar scenario would be more problematic for the U.S. cell industry. As Hill puts it, "The only model our telcos know is a world where they own everything." In contrast, DoCoMo in Japan is fabulously successful because it has recruited 80,000 software vendors (ISVs) to write applications for its infrastructure. "The DoCoMo model succeeds in Japan partly because they have crafted a win-win model between themselves and the application and content providers, which allows many firms to develop services on a profitable basis. That is a lesson that all service providers should learn from," continues Hill.

Why is this interesting to us as hunters of Inescapable Data incarnations? The apparent rigidity of old-line telcos is currently a barrier to a wider adoption and wider penetration of wireless data connectivity for those interested in crossing the connectivity divide. In the interim, the only people crossing the divide are those who are sufficiently attracted by the limited number of applications available. Thus, the "have nots" presently outnumber the "haves." In time, the logjam of have nots will loosen and break free as more compelling applications bring ubiquitous wireless communication services to all who will embrace them.

### Cell Phones That Rock

The music-download industry has been growing rapidly as evidenced by the phenomenal success of Apple's iPod and download services offered by a growing list of e-tailers and retailers (Apple, Microsoft, Sony, and even Wal-Mart and eBay). Apple sells nearly a million iPod-type devices per quarter, resulting in yearly revenue of \$320 million.<sup>1</sup>

Think of it, though. For the connected cognoscenti, carrying both an iPod (or other portable MP3 player) and a cell phone is cumbersome and unnecessary (and maybe not even cool anymore). Enter mobile phones that can also store and play music. Additionally, some forward-looking wireless carriers offer both music-download and streaming services. (Remember, it is all about the application.) Strategic Analytics expects that 54 percent of cell phones by 2009 will be capable of storing and playing digital music.<sup>2</sup>

Chaoticom Inc, a start-up based in Andover, Massachusetts, makes software that allows carriers to offer music-download services for properly equipped phones. Europe appears to be ahead of the United States in this new trend, with more than 20 million subscribers signed on through Telenor (a Norwegian carrier).<sup>3</sup> Some analysts predict that within a few years, as much as 20 percent of all music downloads will be to cell phones. The lure for wireless companies is (what else?) increased revenue. In Europe, cell bills are 14 percent higher on average for those with the music-download service versus those without, and in a marketplace characterized by keen price competition, music could be an attractive way to add a higher-margin, value-add service to a base service offering.

It is unclear, however, whether the current approach that puts cell carriers in the position of being download "gatekeepers" will have staying power. As hybrid PDAs start adding in MP3 capabilities in addition to wireless Internet access (and thus access to the traditional Internet-based pay-per-download sites), will there be any need for special software and services from the wireless companies? Currently, the wireless data speeds are still

<sup>1</sup> <http://www.macworld.com/news/2004/07/14/numbers/>.

<sup>2</sup> <http://www.strategyanalytics.com/press/pr00134.htm>.

<sup>3</sup> <http://boston.bizjournals.com/boston/stories/2004/08/16/story8html>.



relatively slow and the extra compression afforded by specialty software is needed, but 3G services will soon start to roll out higher-speed wireless data communications. In any case, there is a huge demand for digital music provided by electronic distribution avenues, and the invisible cell network is not only an additional pathway but one that drives more convergence of devices such as PDAs, cell phones, and laptops.

### Connecting You

Additional applications will increase wireless data penetration. These applications will have two key attributes:

- They will enable you to wirelessly collaborate with others using the same or other applications.
- They will get your data to you (because you're never in one place anymore or using only one type of device).

"It is no longer about computers being networked together," begins Kenneth Kuenzel, CEO of Covergence, a start-up in the area of network convergence, "it is now about people being networked together without actually being together." People and processes need to rendezvous in real time in the Inescapable Data world. Some of us (those who have crossed the communication divide) often carry three devices, all of which could receive a communication (laptop with e-mail, cell with SMS, PDA with instant messenger and e-mail, and so forth). Sometimes, we are closer to one of those devices. Sometimes, we want a message as e-mail and sometimes as an instant message and hardly ever do we want to process the same message more than once (in case two different devices received it). This is a significant problem for the connected cognoscenti among us because there is not a single infrastructure nor a single provider of all these services.

Furthermore, as we become more connected, we risk erosion of some important social conventions. "IM is invasive," continues Kuenzel, "we don't want the mailroom guy IM'ing the CEO on a whim. We need to be able to maintain some degree of established social hierarchy. Yet, the real value in data today is

in its timeliness. Devices and software therefore need to provide a more casual indication of how willing you are to collaborate using a particular format to a particular party at any given instant.”

Connectedness will require some readjustments. On one hand, as connected members of society, we are saying we want information absolutely instantaneously, and to be sure that we receive it, we carry every communication device possible at all times. On the other hand, we are saying that we worry about being too reachable by both people we do not believe should have access to us as well as by rightful people at inopportune times. We wind up giving some people our cell numbers, different people our e-mail addresses, and different people our instant messaging handles. We need to learn how to manage our new connected lives or all of this will lead to confusion and an unwillingness on the part of neophytes to go deeper.

Some improvements will be made to current connectivity tools such as instant messaging and text messaging, but most likely, new applications will be developed that correctly merge the various communication technologies and add in a renaissance of social hierarchy—connected style—and more end-user awareness. It would not be surprising to see such tools come out of the open-source community given the current disparity between competing tools (which often drives the development of open-source solutions). For sure, there’s a waiting market out there for stuff that helps us better manage our connected lives.

As users of Inescapable Data devices, some of us will find that what is good for business is also good for personal use. Instant messaging (or text messaging) can have as much utility in our home and family lives as it does in business. Some of the connected cognoscenti among us would not expect a child to call just to ask to be picked up from the mall. (We are likely on a conference call anyway.) Instead, a text message can be processed in full multitasking glory. When driving to a soccer game away from the home field, a text message with the field location (rather than a phone call) obviates the need to write down an address while driving, or the need to “thumb” it into a PDA. If one’s favorite Little Leaguer had a great first at-bat, one could clandestinely text message Mom and effect a remote smile. In perhaps the most bizarre communication twist, the acceptance and use of text and instant messaging has changed how we talk when actually using the phone now. Our conversations are choppy, extremely short, and end abruptly (gtg [got to go]); often, we just hang up now without any “goodbye.” Guilty?

### Connected and Truckin'

Think that this connected vision is still a vision of the future? Think again. There are already pockets of advanced connectivity hidden away within our society that are doing incredible things with what is available to them now.

Truckstop.net and Sprint have rolled out WiFi service to more than 3,000 truck stops across the United States.<sup>4</sup> There are more than 4.5 million truckers in the United States, and approximately half of them are avid laptop users. Surprised? Don't be. Laptops deliver many benefits to both truckers and the companies they work for, some of which are not immediately obvious.

"A trucker's cab is his mobile office," explains Alan Meiusi, COO of Truckstop.net, "and as such, they should be able to access the services that they would regularly enjoy as if they were back at headquarters or at home. Enabling them to do more out on the road allows them more time with their families when at home instead of paperwork and business arrangements. It is more than having truckers surf Web sites and send e-mail. It is an integral part of running their business."

Meiusi goes on to explain that truckers use e-mail for order and delivery confirmation, and they use the Web to post available truck capacity or inventory. They also search the Web for freight opportunities and use wireless/GPS for remote check-in and tracking. A typical tractor trailer is an asset worth more than \$100,000, excluding cargo. Add insurance and the driver's salary and the value of that asset triples. There is great interest on the part of the trucking companies to track the asset, maximize usage, and ensure the safety and health of both the tractor and the driver.

WiFi access at rest stops is today being used to upload engine and equipment information automatically back to the operations center. In the future, trucking operations centers will be able to track an individual truck's braking performance, engine efficiency, mileage, and other details. This will greatly increase the safety and reduce the cost of maintaining the vehicle. As importantly, with wireless access, new trip itineraries can be easily downloaded that take into consideration weather, roadwork, and any shift in customer requirements and delivery information.

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<sup>4</sup> [http://www3.sprint.com/PR/CDA/PR\\_CDA\\_Press\\_Kits\\_Detail/1,3685,146,00.html](http://www3.sprint.com/PR/CDA/PR_CDA_Press_Kits_Detail/1,3685,146,00.html).



Some trucking companies distribute training videos and material directly over the Internet to wireless trucker hotspots. Drivers who are required to complete some number of safety-training hours each year can now take those courses from the comfort of their cabs—off road, we hope. By law, drivers are required to be off the road for a set number of hours per day to allow for rest. Tracking the truck in a WiFi hotspot enables the company to prove compliance while at the same time allowing the trucker to be more efficient and catch up on electronic paperwork, training, maintenance instructions, and so forth.

Truckers benefit from and enjoy being connected as well. Being a segment of society that lives largely away from home, WiFi spots give them a sense of community with fellow truckers and open another communication channel with family members. Truckers now rely on e-mail to keep in close touch with their families and can do so at rest stops during normal off hours. Many truckers carry digital cameras and upload pictures of their travels to family members as well as pictures of cargo and receipts back to the operations center. For independent truckers, WiFi connectivity enables them to schedule trips, better optimize loads, and be more accessible to customers during trips. Truckers have also discovered that, by using Voice over IP (VoIP; the technology that allows telephone communication over the Internet) they can place a call to anywhere for free and avoid costly cell phone roaming charges.

So, here is an industry segment that on the surface seems mundane and low tech, but that has not only adopted data connectivity, it now requires it for reasons ranging from increased efficiency to regulated tracking of loads across interstate and international borders. The WiFi technology that allows a large trucking firm's operations center to run its business better is the same technology that allows its employees more comfort and happiness away from home. Large and small firms alike can leverage its values; it is easily within the economic reach of all involved. In the future, we will see tie-ins with more data sources that, for example, could allow a trucker's onboard system to check live road-condition data as reported by nearby truckers and public roadwork databases, access a customer's loading dock status in real time, and so on (from among the many yet-to-be-thought-of data sources).

### City-Wide WiFi

A number of cities are either in the process of rolling out city-wide WiFi access to the Internet or evaluating such a venture. Philadelphia is considering creating a \$10 million city-wide WiFi hotspot.<sup>5</sup> If implemented, this would be the world's largest hotspot. They would locate transmitters on streetlights and other public utility areas around the city to form a large, seamless hotspot. Philadelphia officials are leaning toward making access to the service free in an effort to help make the Internet more available to those city residents who cannot afford to pay monthly service fees, allowing more people to cross the divide.

Other cities already have areas with municipal WiFi networks. Among others, these include Corpus Christi, Texas; Cleveland, Ohio; Long Beach, California; and Spokane, Washington. A prominent Boston city councilor named John M. Tobin wants to establish a pervasive city-wide WiFi network, believing that it will not only promote community awareness, but get both residents and tourists out of their apartments and hotel rooms and into the parks and restaurants. Although Tobin states that his initiative is all about "fairness and accessibility," we note that it could draw more visitors to the city who will spend money and thereby increase tax revenues. (Similarly, a for-profit company is attempting to WiFi-enable a sizeable chunk of Nantucket Island, including the waterways). However, we surmise that, over time, a price will be paid for accessing city-wide WiFi services, either in the form of a direct payment for WiFi access time (the Starbucks/T-Mobile model) or in obtrusive advertisements as a city tax you pay electronically. Are we as connected cognoscenti at the beginning phases of having pervasive (and perhaps free or low-cost) WiFi access (i.e., WiFi wherever we go)? Keep your PDA-tapping fingers crossed.

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<sup>5</sup> <http://arstechnica.com/news/posts/20040901-4149.html>.



## Staying Connected Down on the Farm

Modern farming has become a large operation physically and complex from a management standpoint. Many farming processes have become highly scientific in nature and need constant monitoring of things such as soil conditions and irrigation. Other processes are reminiscent of manufacturing plants, with supply chains that extend into and out of the farm.

With the new complexity and level of investment in technology required to succeed, it is no wonder that large commercial farms now account for more than 50 percent of the U.S. total agricultural output and are the most willing to deploy computer and now networking technologies. Farming is increasingly a global market, and to compete with lower land and labor costs abroad, technology is squeezing unprecedented efficiencies and economies.

For example, wireless and GPS technologies are now being used to guide and drive tractors in real time. John Deere has a set of technologies marketed as GreenStar Guidance that use GPS and can accurately locate tractors down to a few *inches* in the field. Tilling and other similar operations are traditionally a manual operation that can result in nonparallel tracking, which means that either sections are missed or overtilled (leading to measurable wasted time). Some tractors even have the actual “turning” automated so that the lane tracking can be 100 percent controlled remotely, perhaps even operated at night for even more efficiency.

Certainly, GPS/WiFi-equipped farm equipment also aids in inventory tracking of these expensive assets, but the values go far beyond asset tracking. *Precision agriculture* is a fairly recent term used to describe some new methods of farming that exploit remote-sensing information to drive a number of values. Crop quality and yield can vary greatly based on specific characteristics of a small region of the land, yet historically fertilizing and irrigating are uniformly applied to large areas of a farm. Information can now be gathered in-field and in real time for every square inch of land. For example, the new harvester machines can measure the amount of grain and its moisture content on-the-fly<sup>6</sup> of each swath (and coordinates) and transmit that data in real time (wirelessly) back to the operations center. This data can then be correlated and saved for use in seeding, fertilizing, and irrigation, controlled again by automated machinery

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<sup>6</sup> [http://www.geotimes.org/nov03/feature\\_agric.html](http://www.geotimes.org/nov03/feature_agric.html).

that knows precisely where it is in the field. Essentially, every square inch of land can be treated uniquely and automatically controlled by computers through wireless networks, and those computers know *exactly* where the equipment is.

Many data streams come together to help the modern farmer. One is real-time remote sensing, such as the harvester previously mentioned, and similar devices that taste the soil as machinery moves across it. Another is weather forecasts and real-time weather-related data, such as wind direction and speed and cloud cover. Satellite imagery, topographical data, and thermal data can all be combined to understand how to best deal with a given set of conditions. (It turns out that plants grow better in the cooler sections of a farm because of a complicated energy-balancing operation constantly navigated by the plant). This in turn leads to more accurate fertilizing and pesticide usage, higher yields, and less pollution.

On the more business side, real-time yield information coupled with real-time market prices nets more accuracy in managing the supply-demand balance. WiFi-connected farms now have data streams and databases that match real-time inventory and projected inventory against market feeds and price fluctuations. Like other businesses we will examine, the connected farmer has real-time links to his suppliers and can better negotiate prices and far more accurately estimate quantities.

The farmer in the Inescapable Data world is a business man now using connectivity as one of his primary tools—completely unrealistic just a handful of years ago due to the lack of wireless technology and nonexistent data sources. A 1 percent efficiency increase nets more than \$2B in the U.S. \$200B farming business. Wireless, GPS, satellite images, soil tasters, yield-measuring equipment, climate databases, weather forecasts, spot and future prices, and so on combine to bring a new level of efficiency. If it is part of business, any business, it is going to be connected and exploited and in real time. Even farming. Crossing the divide.

### Connected Camping

In 2004, a surprising number of campgrounds across the United States began to offer WiFi services at no additional charge. (In fact, this chapter itself was written while at a campground in Massachusetts and was shared between the authors and editorial staff while 2.7 children were roasting marshmallows and

hoping for cooler weather.) While staying at one such campsite during the summer of 2004 in the Northeast, an observational survey of campers was made to determine the extent and nature of connected camping. Here are the results of this highly informal survey:

- The campground community was almost evenly divided between retired couples over 60 and families whose adults were under 40 and had several kids in tow.
- Casual observance at this particular campground showed that the main users of WiFi were those in the over-60 group, who were primarily keeping in touch with distant family members and participating in various virtual community groups. (They were *not* managing their supply chains.)
- The members of the under-40 group were typically on shorter stays at the campground and could *suffer through* with mere cell phone connectivity for a couple of days.
- One member of the under-40 group was able to barter his way to Internet access for a beer.

Campground owners and operators provide WiFi connectivity as a value-add service because they have somehow gotten the message that it is not only good for business, but that keeping campers happily clicking away in their tents, RVs, campers, and Winnebagos contributes to crowd control. Whether addicted to instant messaging or just keeping up with the Joneses in the neighboring Winnebago, those of us who have crossed the divide have done so for personal reasons that often outweigh the business drivers. Once over the divide, they prefer to carry their connected lives with them.

The connected cognoscenti among us now expect wireless Internet access no matter where they are. They find it critical for continued business operations (no matter what business they are in) or essential to their personal lives. The list of venues where the connected cognoscenti now expect to find WiFi would be astounding to the unconverted observer. (You want to use that thing *here*?) But make no mistake, challenges faced by carriers and conflicting technologies aside, the list of the connected among us grows by the thousands daily, and ubiquitous connectivity is now their expectation with regard to the future. In the words of Dr. Christakis, "Many people, myself included, find it absolutely absurd that they cannot keep current with their e-mail while in a taxi riding through farmland outside of London." Connectivity expectations abound.



## Untethered Displayable Data

Might there be too much data heading our way? How will we deal with the onslaught of even the digested data (information)? Will our thumbs be sore from constant PDA and cell phone surfing? People considering crossing the divide will need more comfortable ways to deal with the onslaught of data.

Some forward-thinking people are convinced that the solution for data overload is to have at least some of the data (or information) presented to us using non-computer-related methods or tools. Data that is presented via small devices that could appear in and around our lives and deliver data in mechanical or color form could relieve our brains from the unwanted overload. "There is the notion that cognitive psychologists call 'pre-attentive processing'—things that your brain can process without any apparent cognitive load," explains David Rose, president of Ambient Devices, an MIT spin-off. "Things you don't perceive as distracting—color, angle, shape, pattern, motion, for example—will allow your brain to focus on more pressing issues. This then frees up your brain for either more difficult cognitive problems or life's daily challenges."

"Hmmm," we think. How so?

It turns out that the concept of displayable data, in spite of all the cognitive load stuff, is straightforward and easily explained through example. One such displayable device available today is called an Orb (from Ambient Devices); it is a small globe-like object that is capable of glowing in different colors while connected wirelessly to a data source. Let's say the Orb is monitoring the price of your favorite stock (Microsoft, maybe?) in near-real time while perched atop a bookcase in your office. As Microsoft's share price goes up during the trading day, the Orb glows green. And, of course, it glows red when the price declines. Perhaps it could be trained to flash red if the decline is precipitous. Deceptively simple, eh? Well, that is the idea. No complex spreadsheet manipulations, no sneaking over to the Yahoo! financial Web site to check the share price during work hours, no thumbing through the financial pages on your way to work. You look, you know. In fact, you may not even have to look directly at the Orb. A mere glance in its direction would tell all. Far less cognitive processing is required on your part and it does not interrupt your train of thought.

Here is another use (albeit less practical) for an Orb-like device: periodically monitor in real time the distance between you and a loved one. Suppose that your significant other travels frequently on business. Give your significant other a cell phone with GPS capability, and you could program the Orb to radiate

warm roseate hues when he or she gets closer, or icy blue tones when moving farther away. How about a pictorial rendering of a nearby city, or an appropriate song, like “I Left My Heart in San Francisco”? As the kids leave for school in the morning, they can “observe” that Mom is still far away but heading home. Later, the Orb glows a loving amber hue as Mom is just about to be dropped off outside.

Along far more practical lines, the cities of San Francisco, Denver, and Chicago are experimenting with displayable data devices that tell bus riders waiting at a bus stop how close the next bus is. The device glows a particular color to indicate the distance or time-wait for the next bus arrival. NextBus manufactures small GPS “pucks” that are placed on the tops of public transportation buses. A NextBus monitoring system aggregates the location information of all buses into a Web-available database. “The public transportation budget in San Francisco is a half of a billion dollars and they lose \$400M a year. They have to run buses every 15 minutes, otherwise people won’t take the bus,” describes Rose (presumably due to too long of a wait period). “If you can increase the awareness of the time of the ‘next bus,’ you can decrease the frequency that buses run and save money.” Those cities are currently using NextBus’ service and giving away Orb-like devices to riders for free. They have experienced a 15 percent increase in ridership simply by giving people a convenient and nontechnical visual tool that helps them know when to get on the bus.

Such bus-monitoring technology will likely be rolled out to school children as well. A major morning stress factor in nearly every U.S. household with school-age children is the mad dash that often occurs when preparing for the arrival of the school bus. Typically, parents send their children out to the bus stop 10 or so minutes early just to be sure that they do not miss it, even in the rain and in freezing weather. Real-time bus-distance information conveyed by a simple observable object near the front door could alleviate much of this stress.

How about some other creative uses for display information technology:

- ♦ IBM is experimenting with using a displayable technology to indicate a project’s status (Are we behind? How far?) that hangs on a wall much like a clock.
- ♦ Orbs could be used to suggest vacation-area sailing conditions for those avid sailors among us (cue up the sound of waves crashing against the hull).

- Or skiing conditions atop your favorite mountain (an Orb with miniature swirling snowflakes inside).
- Or the three-day weather forecast (images of sunglasses or galoshes are projected on the wall).
- Or your wife's fertility (bells and whistles).

Some of the information is for fun; some of it is for practical purposes. A somewhat surprising benefit of displayable data lies in the presumed ability to actually change behavior patterns. If your electric company placed an energy-efficiency Orb next to your thermostat, you might become a more efficient energy user. If you see that the project at work is slipping, you might work a bit harder. If you could see that your own personal body metrics (heart rate or temperature, for example) were meandering away from normal, you might behave differently or eat differently, or maybe even exercise more regularly. Displayable data could enable a wider set of people to cross the connectivity divide.

Those of us already living deep into full connectivity can survive with the rudimentary PDA-based Web surfing (and other similar technologies) available today to access data. But this is not sufficient for a large section of the population, such as urbanites waiting for the bus to get to work. In many ways, we are already trained and willing for more passive display sources. We populate our homes with clocks, with thermostats, with outside temperature gauges, humidity sensors, and a battery of gauges. More pervasive wireless coverage and decreasing costs of computer and cell equipment will help the new forms of data presentation, but we will not become a fully connected society until all of us have mass means to exploit information. Displayable data can politely push information to large audiences. When the average lower-income city dweller can waste as little time waiting for the bus as the adjacent luxury condo owner, we have achieved a new value in the saturation of data in our lives. As with the washing machine, all classes benefit.

### **Religion and the Connected**

Many of the world's religions are adapting to connected technologies at different speeds. Religion, at its core, is all about communicating, and thus connected technologies should naturally find a home. Although there seems to be a spottiness in

the patterns of technology adoption at the local level, there are some notable happenings in the broader world view.

Muslims pray five times per day—at sunrise, at noon, afternoon, sunset, and midnight—and they have to face in the direction of Mecca. In the desert and in other areas, it can be difficult to find the right direction. They can now use their cell phones to respectfully find the correct direction of Mecca for their daily prayers.<sup>7</sup> LG Electronics (and others) are making cell phones with an embedded compass and an ability to point to a particular direction.<sup>8</sup> LG's G5300 phone is able to indicate to the user the correct direction of Mecca after being fed some location information. There are more than 1.1 billion Muslims in the world, and a relatively ordinary cell phone can now allow them to tend to their daily prescribed ritual more easily. LG is specifically targeting this audience.

In another example, the Vatican issues text messages (SMS) to subscribers' phones containing daily prayers. A service from [www.popemessage.com](http://www.popemessage.com) will send a daily message taken from the pontiff's teachings to subscribers' cell phones. To subscribe, users just send an initial SMS message 'POPE ON' to the number 24444, and the process starts automatically. There is a small fee of between 10 and 30 cents per message received. This service has been received sincerely by subscribers who welcome a short daily papal message as a welcome interruption to an otherwise harried day. (Note here the value of immediate yet asynchronous nonvoice messaging—a theme we explore in the following chapter). This service is overwhelmingly successful and follow-on services with more rich features are in the works. Many priests, reverends, and rabbis have similarly started text messaging their parishioners' cell phones, for those who could use a little prayer boost in a time of need, or simply as a reminder that a spiritual leader is thinking of them.

Some effort is even being made to produce live masses (or other services) from locations around the world broadcast to your cell phone. Perhaps during an afternoon lunch walk to get away from the stresses of the office cube (or cubeless) society, you'll take in a live evening Irish mass. Perhaps you'll "message" a clergyman in some far-off country encouraging him in his missionary work. In much the same way that technology allows businesses to be more continuously

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<sup>7</sup> <http://www.wired.com/news/culture/0,1284,64624,00.html>.

<sup>8</sup> [http://www.lge.com/ir/html/ABboards.do?action=read&groupcode=AB&list\\_code=RND\\_MENU&seq=3179&page=1&target=rndnews\\_read.jsp](http://www.lge.com/ir/html/ABboards.do?action=read&groupcode=AB&list_code=RND_MENU&seq=3179&page=1&target=rndnews_read.jsp).

connected, so too it seems that our religious lives could be enriched with closer (albeit less physical) contact.

PDA devices have been a boon for biblical scholars and general civilians. Selected portions of the Bible or the entire Bible (or other religious doctrine) can be downloaded and rapidly cross-referenced to easily find a needed passage wherever you are. Online services offer to download specialty material daily that users can read at their leisure. PDAs and cell devices are now an additional tool for religion that provides convenience and saves time.

*Tech News World* ([www.technewsworld.com](http://www.technewsworld.com)) recently interviewed Tom Ferguson, associate deputy of interfaith relations for the Episcopal Church.<sup>9</sup> “Religion is not embracing the information revolution; it’s reaping what it sowed hundreds of years ago. Religion created the information revolution that has been ongoing,” explains Ferguson in the interview. “People crave religion and spirituality without having it crammed down their throats in church. Anonymity and having the user be the one in charge have driven the [...] spirituality engines. Technology has allowed thousands—if not millions—of people to begin to develop spirituality outside of the traditional power structures.”

Ferguson acknowledges that elements of religion are going through a telecommuting style change much like businesses are seeing. “I live in Los Angeles and work for the New York office. While this is common most everywhere and is a no-brainer to most people reading this, it’s taken the church a long time to fully embrace telecommuting. There’s so much in religion that needs a home, a center—a Vatican, Jerusalem, a Mecca, a Ganges River. This is going to be broken down in coming years. The definition of place and center will have to be re-imagined.”

Indeed, finding “place and center” will have to be re-imagined in the connected world as technology allows a stretching of physical boundaries. Religion can thrive in the newer, more connected world, given the vastness of Web connections allowing people to self-organize and more easily share common views and find the information that most interests them. It will be different, no doubt, from the religious experience of our youth.

In pockets, members of religious communities are crossing the divide, to their benefit.

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<sup>9</sup> <http://www.technewsworld.com/story/33078.html>.



## Summary

Years ago, the concept of a digital divide drew a line between the computer literate and illiterate. Both companies and people took varying lengths of time to embrace the power of computing technology and cross the digital divide. We observe that our culture remained essentially unchanged when the majority of the general population was in the precrossing phase. However, as momentum built behind PCs first and then the Internet, cultural foundations such as education, government, entertainment, and health care began to change and adapt to the newly computer literate majority. Over time, those who remain on the other side of the divide become more disconnected from the cultural mainstream that is increasingly driven by the computer-literate majority.

We see a similar phenomenon emerging with data and information connectivity. Here, the new divide to be crossed is the connectivity divide. We see our children crossing this divide in droves, as evidenced by their seeming addiction to wireless text messaging and IM. In time, the two will represent the connected majority, and a similar cultural shift will follow.

For now, most of us have crossed the digital divide (perhaps more so than we would care to admit at times). Pervasive connectivity (wired and wireless) will allow information to ebb and flow through our digital networks more freely and to more places, increasing business and personal productivity, and enhancing entertainment, enticing us over the connectivity divide. In a more perfect Inescapable Data world, cellular carriers will be driven to adopt standard communication methods on a worldwide basis such that we can experience seamless connectivity from home, to work, to the beach. Network intelligence will be cognizant of and embrace the fact that we could have many modes of communication at our disposal and will streamline the appropriate messages to the appropriate devices. We will continue to use synchronous and wired communication modes for both voice and data, but we will increasingly seek wireless modes for the freedom they allow. We will also learn to appreciate the many new ways in which we will be able to acquire information, ways that could be non-numeric, nontextual, and unobtrusive, yet every bit as effective as a red stop light or a blinking elevator button.