

The Wireless Customer Experience

An Introduction

by Zimran Ahmed
and Mark Hurst

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CREATIVE good.

good@creativegood.com
www.creativegood.com

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Creative Good (www.creativegood.com) is a 35-person consulting firm based in New York, San Francisco, and Boston. We're on a mission to improve the online customer experience — on wireless services, Web commerce sites, intranets, b2b sites, and other Internet services. A recent wireless client is Upoc (upoc.com), for which Creative Good provided wireless customer experience consulting.

Please contact us if Creative Good can help improve your wireless service!

Mark Hurst, founder and president
mark@creativegood.com

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Introduction

The wireless Internet is the most important recent development of the Net. Millions of customers worldwide now use wireless devices such as pagers, cell phones, and PDAs (personal digital assistants) to send and receive data. And wireless activity is only going to increase. Research firm IDC projects that by 2004, more than 1.3 billion people will have cell phones or other wireless devices that can access the Internet [1].

As hundreds of millions of investment dollars flow into the fast-growing wireless industry, we notice that most wireless companies seem to have forgotten the single most important factor in their success: the customer experience. Customers will only use the wireless devices and services that *quickly* and *easily* add some value to the customers' lives. Yet except for the everyday voice phone call, most wireless services today are slow, confusing, and frustrating for the average customer.

Hence this report attempts to fill a gap in all of the articles and research written about wireless to date: we will discuss why the often-ignored *customer experience* is the most important thing for wireless companies to focus on.

This report discusses the wireless customer experience: what it is, why it's important, and how it affects the wireless industry.

The wireless Internet

Customers will use wireless devices to access the Internet only if they have a good reason to do so. “Just because they can” is not a reason why customers will use a wireless service. This has been made painfully clear by the growing backlash against WAP (Wireless Application Protocol) as it is rolled out, and ignored by customers, in Europe [2]. In Germany, for example, where WAP is widely available, less than 1% of cellular subscribers opt to use the service, and those who do only access the Internet from their phones, on average, once a week [3].

Why are people not flocking to many wireless Internet services in the same way that they flocked to the Web? Because the wireless industry is not focused on the customer experience.

To succeed, a wireless service must provide a customer experience that is better than existing alternatives.

Few companies today offer wireless services that interest customers. Users of WAP phones rarely use their devices to access the news headlines, weather reports, and sport scores that make up the bulk of currently available WAP content [4]. After all, that content is easily accessible through many other channels, such as newspapers, radio, television, and PC-based websites and e-mail. (Note: Throughout the report when we refer to “wireless devices,” we mean *handheld* wireless devices such as cell phones and PDAs, not laptops with wireless connections.)

Yet traditional content remains at the center of most wireless companies' strategy. The major U.S. carriers — Verizon, AT&T, SBC/Bell South, and Sprint — focus their wireless Internet services on news, weather, sports scores, and stock quotes. Sprint's "wireless Web" service, for example, focuses on its news, weather, and sports offerings from a variety of providers. Sprint customers must scroll through these menu options before they can access any other services, which are tucked away on the second page.

The wireless industry has mostly ignored the customer experience for a variety of reasons: launching services quickly to gain market share, or being seduced by the hyped-up possibilities of the technology, for example. As a result, many basic services are too difficult to use. Sprint's wireless e-mail service, for example, requires its customers to set up an account and password before using the service. This is a poor design, since it's difficult for customers to enter text on the phone keypad. If Sprint had focused on the customer experience, it could have avoided that mistake by simply identifying customers by their (unique) phone numbers.

Voice is still the wireless "killer app"

Before getting too far into the customer experience of wireless features, however, it's important to note the one feature that stands far above all others in importance: *voice*.

Most customers use wireless phones for voice phone calls.

In other words, most people buy cell phones so that they can make phone calls. The customer experience of wireless phone calls, after all, is better than relying on pay phones or not being able to call at all. It's also no coincidence that this most basic use of wireless is also the most popular. This corresponds to Creative Good's past Web research, which has found that the simplest, most basic website features are usually the most popular.

Despite the hype they get in the press, wireless data features are much less popular than wireless voice. For example, In Japan, the country with the highest wireless Internet penetration in the world, mobile voice subscribers outnumber mobile data subscribers by about five to one [5]. And as a recent Wall Street Journal article pointed out, "From Sweden to Germany to the U.K., consumers are saying that they can't see any compelling reason to use WAP services regularly" [3].

The only way for mobile data features to succeed is to provide a good customer experience — either by offering a better experience than what customers get in non-wireless features, or by allowing customers to do something new that they couldn't do at all without wireless. A good example is the success of SMS (Short Message Service, or wireless text messaging) in Scandinavia. Since sending a text message is cheaper than making a phone call, teenage users have driven a high degree of SMS usage [6].

The wireless customer experience

A good wireless customer experience involves much more than usability or interface design. The service needs to make sense within the constraints of wireless technology and small, handheld devices. And as stated above, the wireless feature must provide a customer experience that is better than existing alternatives. For example, wireless Internet access in Japan is more convenient than wired (PC) Internet access because of low PC penetration and a variety of other cultural and economic factors [7].

Many wireless companies treat the wireless Internet as if it was just the Web, but on a cell phone. Sprint, for example, calls its wireless Internet service “the wireless Web.” The truth is that the wireless Internet is nothing like the Web. Any wireless service that shovels a Web service onto the cell phone will not create a good customer experience.

Customer experience in wireless is not the same as on the Web.

With this in mind, customer experience in three areas — content, e-commerce, community — will be different on the wireless Internet from what they are on the Web.

Content is different on wireless devices

Some content providers view wireless as a new channel they can push their content through [8]. But wireless content is different from Web content, because of the wireless customer experience: it's difficult to read much text on the tiny, low-resolution screens of handheld wireless devices. Content like news and sports has not attracted many wireless users, since (as we argue above) that content is easily available through non-wireless channels that provide a better customer experience.

Nevertheless, there have been some examples of wireless-specific content that customers are interested in receiving on their phone. In Japan, for example, one popular service is a one-dollar-per-month deal from Bandai that sends a new cartoon character to customers' i-mode screens every day. It now has over 700,000 subscribers [9]. Such a service wouldn't succeed on the Web — charging a dollar a month to get a tiny graphic — but wireless customers have been enthusiastic about it.

E-commerce is different on wireless devices

Wireless e-commerce, also known as mobile commerce or “m-commerce,” will not succeed on a grand scale. The e-commerce customer experience is just too difficult on wireless devices. With tiny screens, no graphics, and poor text entry, wireless devices make most shopping and search features very difficult to use. For example, on Amazon.com's wireless site, finding “Of Mice and Men” requires over 40 keystrokes using the search function, since the book isn't available through the WAP menu hierarchy. (Customers can discover the book's absence *only* by looking through each menu.)

Certain kinds of products can succeed in wireless e-commerce. These will be products that satisfy one or more of these criteria:

- limited choice
- predictable availability
- do not require much data entry to select

For example, the New York Times bestseller list meets all three criteria. It would be easy to buy any of the books on the list via a wireless device. (Whether customers would *want* to buy bestsellers from their cell phone is a different issue.) Tickets to popular entertainment events might be another such product.

Finally, even if wireless e-commerce meets the above criteria, it also requires that the cost of items be directly added to the phone bill; typing in a credit card number on a wireless device would ruin the customer experience.

Community is different on wireless devices

Most online communities, like those on e-mail lists and Usenet groups, wouldn't work well if transferred directly to wireless. The small screens and limited text entry

on wireless devices make it difficult for people to exchange meaningful amounts of information with other participants.

Nevertheless, wireless can add value to *existing* communities by allowing people to keep in touch when they are on the move. For example, teens in Norway send text messages to tell friends about parties and other social events [6]. (However, while text messaging using SMS is almost ubiquitous in Europe, it is rare in the U.S. — an estimated 20 million short text messages per month are sent in North America, compared to over one billion a month in Germany alone [10].)

SMS in Europe is a good example of how wireless data usage can grow if it provides a good customer experience. Sending SMS messages from phones in Europe is as easy as typing in the message, selecting the recipient from your address book, and hitting “send” — there is no need to dial into a wireless Internet service provider. A good customer experience, comprised of easy-to-use features and compelling functionality, has surely contributed to the dramatic increases in SMS usage on wireless phones in Europe — an 800% increase in Finland in 1998 alone [11].

In the U.S., by contrast, most carriers do not support originating a text message on the phone at all (except for Voicestream, which runs on the GSM standard common in Europe). Although not a carrier, another notable company is Upoc (www.upoc.com), the wireless service that allows U.S. customers to originate text messages from their phones, regardless of their carrier. (Full disclosure: Upoc is a Creative Good client.) Customers with WAP-enabled handsets can dial into a WAP browser and use an e-mail application to compose and send their message, but this is more complicated and expensive than sending a simple SMS message on a phone in Europe.

There are several ways in which the U.S. wireless industry constrains the customer experience and therefore hampers its own growth; we’ll cover that more in the next section.

Constraints of wireless

The wireless customer experience is constrained by two main factors:

- *The device's physical interface:* Mobile wireless devices, meant to be carried and used on the move, must fit comfortably in the pocket, be light enough to carry, and be small enough to operate with one hand. Therefore devices cannot grow beyond a certain size and weight.
- *Network technology:* Wireless Internet access, to be available consistently across a huge physical area, is inevitably on a network that lacks bandwidth (compared to the “wired” access of DSL, ISDN, or even dialup) and comes with other constraints.

Therefore, the wireless Internet can be defined by its *constraints*: both a small physical interface and the constraints of the network. (Both of these constraints will improve in the coming years, but as of late 2000 they are in effect and unavoidable.) To create a good wireless customer experience and thereby succeed in the wireless industry, businesses must accept and work within these two constraints.

Device constraints

To be portable, wireless devices must be small, lightweight, and their battery must last as long as possible. Therefore, there are several constraints on the device itself:

- *Weak processor:* Wireless devices do not have the fast, powerful processors that desktop PCs have. Because they must conserve battery power, wireless devices use

slow and weak processors. (This also minimizes purchase cost, an important consideration for any handheld consumer product.) As a result, they must only offer simple features that do not require much processor power. For example, rendering 3-D graphics would not be a good application for a wireless device.

- *Limited memory*: Memory chips are also limited, offering far less storage than what a PC offers. Thus, for memory-intensive tasks, devices like PDAs store their information by synching with external devices like laptops.
- *Tiny screens, poor resolution*: To stay pocket-sized, wireless displays will likely never get bigger than the Palm Pilot screen — 6 cm by 6 cm. To conserve battery power, wireless displays also have poor resolution, and few have color. The most basic WAP screen currently holds four lines of text, with 12 characters per line.
- *Poor data entry*: No handheld device has a data entry system that approaches the ease-of-use of a full PC keyboard. The RIM Blackberry's two-thumb keyboard is the most efficient text entry interface currently available for a wireless device. Until much better speech recognition becomes available for wireless devices, data entry will always be limited.

Network constraints

Wireless devices are also constrained by the cellular networks they run on:

Packet-switched vs. circuit-switched

The way the network is designed (or “switched”) has important consequences for the wireless customer experience:

- A *circuit-switched* network requires a device to dial in and establish a connection before exchanging data. This is how regular phones work; dialup PC users must dial into an ISP with a modem before accessing the Internet.
- A *packet-switched* network does not require a device to dial in. Instead, the device is always on the network. This is similar to how it works for a PC on DSL or a T-1; the PC can access the Internet at any time without having to dial in.

U.S. carriers predominantly use circuit-switched networks, requiring customers to wait through a dial-in process before using any wireless services. (Exceptions are Nextel's iDEN and AT&T's CDPD, both packet-switched.) In Japan, by contrast,

NTT DoCoMo's i-mode service runs on a packet-switched network, so i-mode handsets are always on the network and respond instantly. In Europe, SMS runs on *circuit-switched* networks, but still delivers an instantaneous packet-switched-like response because it dials in only *after* the user composes the message and hits "send." Instant response is crucial to a good wireless customer experience — whether through packet-switched networks or intelligent use of circuit-switching.

Slow network speeds

Current wireless data transfer rates are advertised at around 9.6kbps (less than half the speed of a 28.8kbps dialup modem). In operation, because of network congestion and other technical factors, the actual rate is often even slower. Wireless applications must therefore be especially efficient to deliver a good customer experience under such slow transfer rates.

U.S.: Limited capacity, limited coverage

In the U.S., competing standards and legacy networks have resulted in a cellular infrastructure with limited capacity and coverage. Coverage outside the U.S. is better, so calls are dropped less often [12]. In fact, in Japan, cell phones often work indoors, in the subway, and in elevators.

Unlike with regular phone lines, wireless connections — especially in the U.S. — are occasionally dropped and cellular circuits are occasionally busy. A properly designed wireless service is prepared for the instance when the signal is dropped. For example, if the customer is in the middle of a transaction, the wireless service will retain state (or "remember" where the customer was) for when the customer dials in again.

"Inch scale"

A final way to consider the constraints on a wireless device is to think about *scale*.

As noted above, mobile wireless devices must be small enough to fit in the pocket or the hand. The user interface of these devices, then, must be built to the "inch scale." Scale depends on the physical size of the device and can help determine which applications are appropriate.

- Inch scale: Post-it notes, Palm Pilots, and cell phones are all handheld, or

“inch-scale,” devices. Their small size allows mobility but limits data input to one hand (since the other hand holds the device). Applications must be simple enough to be presented on a small device, and to be used by one hand.

- **Foot scale:** A legal pad, a PC Web browser, and a PC’s keyboard and mouse are all “foot-scale” devices. They are not as portable as inch-scale devices, but their larger size does allow both hands considerable space and freedom to input data. Applications may therefore be more complex than that of the inch-scale device.
- **Yard scale:** White boards and conference tables are “yard-scale” devices. They are not portable, but their large size allows several people to gather and collaborate around them. Displays should be readable from feet or yards away. Their collaborative function, as well as their physical size, means that their interfaces may be quite different from that of a foot-scale device. Switching tasks, for example, could involve taking several steps.

Scale helps determine the kind of tasks that are appropriate for a device. For example, foot-scale devices are more appropriate than inch-scale devices for tasks that take some time — writing several pages of notes, editing documents, and interacting with websites, for example. Inch-scale devices, on the other hand, are better for simple, more immediate tasks: dashing off a brief Post-it note, dialing a phone number, checking the calendar on a Palm Pilot or daytimer.

One way to evaluate a wireless application, then, is to think of it in terms of inch-scale devices. Ask the question: is this a task that customers could accomplish on a Post-it note (or another tool of that size)? If the answer is yes, then the question becomes, will customers *want* to accomplish this task on a wireless device? As stated above, the wireless device must create a customer experience that is better than existing alternatives.

PDA's and inch-scale thinking

The Palm Pilot is a good example of a product appropriate to inch-scale thinking. Designed to fit in the pocket and to be used on the move, the device is fast, simple, and focused. The Palm has no database, spreadsheet, or word processing application — these are all tasks that are poorly suited to the inch-scale.

Microsoft’s Windows CE product and Psion’s EPOC product are the other two main handheld devices on the market. Unlike the Palm Pilot, however, they are examples of poor “inch-scale” thinking. Both are loaded with word processors, spreadsheets,

and other complex software.

Instant response

Inch-scale applications, and thus any wireless services, must *respond instantly* to deliver a good customer experience. While users may tolerate a desktop computer taking five minutes to start up before writing a lengthy essay, they will not tolerate a five-minute delay before sending a quick wireless text message, just as they will not tolerate a five-minute delay before writing on a Post-it note.

Scale and device constraints

Coincidentally, what users typically *want* in an inch-scale application is what wireless devices are *forced* to deliver because of the device constraints (as discussed above). For example, inch-scale tasks should be quick and simple, *and* wireless devices are constrained to quick and simple applications because of their weak processors. Thus both “inch-scale” thinking and technology constraints can guide a wireless company in creating a good customer experience.

(By the way, this coincidence between technology constraints and appropriate use is not always present. After all, today’s PCs use super-fast processors that allow for much more complex applications than most users actually use.)

Wireless industry overview

The previous section reviewed the inherent constraints built into the wireless medium. This section reviews how U.S. carriers have adopted misguided strategies that will retard the growth of the wireless industry.

About U.S. carriers

There are four major U.S. wireless “carriers,” or cellular phone service providers. Together, these four carriers account for about 70% of all wireless subscribers in the U.S.:

- Verizon Wireless
- AT&T
- SBC/Bell South
- Sprint

Each carrier has its own wireless portal (the first screen customers see when they starting up their wireless browsers). AT&T charges customers extra if they want to access wireless services that are not part of its wireless portal. This is different from the wired Internet, in which customers can use any phone line to dial into any ISP, and then access any website. To retain complete control of the customer while on the service, carriers provide both the content and the service that carries it. (This is similar to the strategy AOL adopted in the online services industry.) As Carlton Hill, director of the Internet initiative for BellSouth, put it, the carriers “have learned some

of the lessons of protecting yourself, as a transport provider, from becoming a commodity” [13].

This “walled garden” strategy limits the wireless services available to customers, and therefore degrades the overall customer experience. By contrast, NTT DoCoMo in Japan has a more open policy, where (as on the Web) any user can put up a site accessible to all users. Since DoCoMo’s i-mode handsets understand HTML, building an i-mode site accessible by all DoCoMo phones is as easy as putting up a regular website. Not surprisingly, there are now over 22,000 wireless sites available via DoCoMo, offering everything from train schedules to cartoon screensavers [14].

It’s also quite difficult for U.S. customers to access wireless Web services not offered on their carrier’s portal page. Since the wireless browser on American cell phones does not have a built-in “go to URL” function, customers must find this option as a menu selection off the carrier’s home page. For Sprint customers, this means going to the second page on Sprint’s wireless portal and scrolling all the way to the bottom of the screen.

There are several other ways that the wireless customer experience is inhibited in the U.S.; we discuss them below.

Pricing structure

There are two main differences in the pricing structure of U.S. and European carriers. In both cases, the U.S. pricing structure hurts the customer experience:

- U.S. carriers price on a flat-rate model, in which customers pay a predetermined fee for a predetermined amount of service. Europe and Asia, however, both follow a metered payment structure which allows customers to pay for service as they go. This metered payment structure has evolved into a micro-payment system where usage revenues can be shared between carrier and wireless service provider. This means that service providers in Europe and Asia do not have to resort to wireless advertising for their revenue, while American service providers may have to (since carriers will otherwise keep all the revenues). Placing ads on a wireless device’s tiny screen makes for a bad customer experience.
- The U.S. is unique in having a “both parties pay” structure, in which *both* the calling and the called parties pay for a cellular phone call. (Outside of Canada and the U.S., only the calling party pays.) Because of the more expensive pricing structure, U.S. users have less incentive to leave the phone on to receive calls.

System incompatibility

All carriers in Europe, and most carriers in the rest of the world, operate on a GSM standard (Global System for Mobile communication). This simplifies owning and using a wireless device, since GSM phones are compatible with all GSM networks, regardless of country.

The U.S. wireless infrastructure, on the other hand, is built on a number of incompatible platforms, including CDMA, TDMA, AMPS, and a host of other complicated acronyms. These platforms make for a poor customer experience; for example, customers on a CDMA network can't send text messages to customers on a TDMA network.

Unfamiliarity with wireless

Wireless Internet and wireless text messaging services are new and unfamiliar to customers in the U.S., causing carriers to scramble to give their wireless services clear names. For example, text messaging in the U.S. is called by at least three different names:

- “Digital PCS phones with text messaging” (AT&T)
- “Wireless Web Messaging” (Sprint)
- “Wireless e-mail” (SBC/Bell South)

The challenge here is less about feature names and more about customers who are largely unfamiliar with wireless in the first place. Wireless service companies have the dual challenge of educating customers about their product (text messaging) and the technology (wireless) that it runs on. This would be like an e-commerce company having to explain both their product and how the Web works.

No-hype answers

Currently, the hype around wireless has focused on the opportunities and ignored the constraints. The press churns out stories about the “‘red hot’ mobile commerce market” [15] but has not focused on why someone would want to shop through a screen the size of a Post-it note. The result has been a number of claims, predictions, and strategies that reflect a poor understanding of the wireless customer experience.

To dispel some of the hype around wireless and its potential, here are some no-hype answers to important questions about wireless:

Q: Does it make sense to run Java on a wireless device?

A: No. Software written in Java is compiled when the program runs, which means that the customer must wait extra time for the software to start running. Inch-scale devices, as described above, have small memories and weak processors. This makes them particularly unsuitable for any activity that requires lots of memory and processor cycles — such as compiling and running Java while the user waits.

Despite this, there’s plenty of wireless Java development going on. Sun has released and continues to develop its Java 2 Platform, Micro Edition, designed for consumer and embedded electronics such as phones and PDAs (see <http://www.java.sun.com/j2me>), but unless it runs as quickly as existing application platforms, it will create a slow and therefore frustrating customer experience.

Here's another way to think about it: wireless devices are poorly suited to slow, processor intensive tasks, just as Post-it notes are poorly suited to lengthy, complicated tasks.

Q: Does streaming media make sense for a wireless device?

A: No. Wireless devices are equipped with small screens and poor resolution. Wireless data networks offer low bandwidth. In particular, streaming video requires much better displays (bigger, and with more resolution), and much, much more bandwidth from the network, to deliver a good customer experience.

Q: Does advertising make sense for a wireless platform?

A: With tiny screens and low-bandwidth connections, wireless devices don't have much screen space to devote to advertisement. Even a small text ad could eat up 25% of the available screen space on a wireless device. Relatively speaking, on a PC display this would be equivalent to over four standard website ad banners.

Q: What about WAP?

A: Of all the technologies surrounding wireless, one of the most hyped, and misunderstood, is WAP (Wireless Application Protocol).

Technically speaking, WAP is a protocol that allows wireless devices to access the Internet, in the same way that other protocols (TCP/IP and HTTP) allow desktop PCs to access the Web. WAP can run on both circuit- and packet-switched networks across a wide variety of standards, and it's designed to allow data transmission across a variety of extremely bandwidth-constrained networks.

Despite the flexibility of the protocol, WAP is a contentious issue because so many companies have invested in creating and promoting WAP: its infrastructure, devices, and so-called "WAP sites" — a sort of scaled-down website accessible only by WAP-enabled cell phones and other devices. Yet despite all the investment, WAP still has not become popular with customers [2].

There is vigorous disagreement within the Net industry about WAP's prospects: ZDNet Australia declared that "WAP is Crap" [16], while Heikki Tarvainen, director of mobile services and business development for Nokia, believes that WAP will remain as a platform standard [17]. Creative Good believes that WAP has little chance for success.

WAP will not succeed in the current wireless marketplace.

Unless carriers and other wireless companies make dramatic improvements to the WAP customer experience, WAP will fail. There are simply too many obstacles to a good WAP customer experience today. We discuss three such obstacles below: the need to dial in, the lack of services, and the expensive usage.

- *The need to dial in:* Customers must dial in to use their WAP browsers. For example, in order to use any feature on any WAP site, customers must dial into their WAP browser and wait for the service to connect. Yet (as discussed above) customers demand instant response from wireless services, and dialing in takes too long to provide a good customer experience. Before WAP can be successful, carriers will have to upgrade their networks so they can provide an “always-on” connection, eliminating the need for customers to dial in before accessing wireless services.
- *Lack of services:* Customers in Europe have been unimpressed by the limited WAP services currently available to them. While NTT DoCoMo’s i-Mode service in Japan adds over twenty new sites a day ranging from games to cartoon screen savers to dating services, European WAP users have access mostly to generic content available through other channels, such as news headlines and weather reports. Carriers should abandon the idea of being gatekeepers for wireless Internet services and instead run open networks, promoting the development of many WAP sites (as on DoCoMo). This will foster WAP services that customers will value.
- *Expensive usage:* WAP is currently too expensive for customers to use, compared to online access via PC at about \$20 a month in the U.S. In addition to a monthly fee of \$10 to \$15, WAP services in the U.S. charge at the same rate as a regular cell phone call: around \$0.33 a minute [5].

WAP also lacks certain important technical features, such as end-to-end security, user agent profiling, network-initiated content delivery, and a number of other features related to billing and gateway switching. But it’s important to note that the WAP protocol *itself* is not inherently responsible for many of the problems in the WAP customer experience. Instead, most of the problems listed above (lack of services, carrier-imposed content restrictions, slow response times, etc.) have nothing to do with the WAP protocol itself, and everything to do with the circuit-switched networks running WAP, the carriers, and other forces of the wireless marketplace.

Resources

Below are some useful websites with news, commentary, and research about wireless. You can also find the Resources links from this page:

<http://www.goodexperience.com/wireless>

General wireless resources

- <http://www.anywhereyougo.com>
- <http://www.allnetdevices.com/wireless>
- <http://www.unstrung.com>
- O'Reilly Network: Wireless DevCenter
<http://www.oreillynet.com/wireless/>
- Usable Mobile (e-mail discussion group):
<http://www.usablemobile.com>
- <http://www.dashdot.org>
- <http://ubicomp.editthispage.com>
- KEITAI-L (e-mail discussion group Web-enabled phones, especially in Japan):
<http://www.appelsiini.net/keitai-l>
- About wireless in Japan:
<http://anima.editthispage.com>

WAP resources

- <http://www.wapforum.org>

- Asia WAP Resources Center:
<http://www.zdnetasia.com/specials/wap/>

Other

- Mark Weiser's Ubiquitous Computing page:
<http://www.ubiq.com/hypertext/weiser/UbiHome.html>
- About telecommunications:
<http://www.totaltele.com>
- The Palm Design Philosophy:
<http://www.palm.com/devzone/docs/pptdg/TableOfContents.htm>
<http://www.palmos.com/platform/philosophy.html>
- Good Experience:
<http://www.goodexperience.com>
<http://www.goodexperience.com/wireless>
update@goodexperience.com (customer experience newsletter)

Endnotes

Note: For those articles with URLs, if you'd rather not type the whole URL by hand into your browser, we have prepared a page with clickable links to those articles:

<http://www.goodexperience.com/wireless>

[1] IDC, "Wireless Access to the Internet, 1999: Everybody's Doin' It," December 1999.

[2] The Guardian, "Shall we scrap WAP?" August 31, 2000.

[3] The Wall Street Journal Europe, "Immobile Phones: The WAP Bubble Has Sprung a Leak," June 30, 2000.

[4] The Standard, "Wild about Wireless?" July 31, 2000:
<http://www.thestandard.com/article/display/0,1151,17166,00.html>

[5] Organization for Economic Co-operation and Development: Cellular Mobile Pricing Structures and Trends, 1999. NTT DoCoMo i-mode subscription figures:
<http://www.nttdocomo.com/num.htm>

[6] Rich Ling and Birgitte Yttri, Telenor R&D, "Micro and hyper-coordination through the use of the mobile telephone," December 17, 1999.

[7] New York Times, "Internet in Japan Is Riding a Wireless Wave," August 14, 2000.

[8] Wired, "Will WAPers Be Readers?" Aug 7, 2000,
<http://www.wired.com/news/technology/0,1282,37833,00.html>

[9] Economist, "I-modest success," March 11, 2000.

[10] GSM Association, "G-Mail growth: Global surge continues," April 25, 2000
http://www.gsmworld.com/news/press_releases_55.html

[11] Organization for Economic Co-operation and Development: Cellular Mobile Pricing Structures and Trends, 1999.

[12] The Yankee Group, press release, "What Explains Poor U.S. Wireless Coverage?" July 27, 2000.

[13] TechWeb News, "History Won't Be Repeated On Wireless Web," July 11, 2000: <http://www.techweb.com/wire/story/TWB20000711S0014>

[14] BridgeNews, "NTT DoCoMo to Set Up W-CDMA Venture with U.S. Carriers, Content Providers," September 22, 2000:
<http://www.AnywhereYouGo.com/ayg/ayg/wireless/Article.po?id=108014>

An earlier count of i-mode sites may be found here: The Guardian, "The Japanese craze that could wipe out WAP," June 15, 2000:
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About the authors

Zimran Ahmed, customer experience analyst

zimran@creativegood.com

Zimran Ahmed, Creative Good analyst, serves as the company's "wireless advisor." Prior to joining Creative Good, Zimran worked as a technology consultant at Community Wealth Ventures, a firm that advised on social enterprise. He was also an associate programmer at D. E. Shaw, a hedge fund. Zimran graduated magna cum laude from Harvard University.

Mark Hurst, founder and president

mark@creativegood.com

Since founding Creative Good in 1997, Hurst has increased revenues by tens of millions of dollars for a client list including Upoc, Gateway, Travelocity, and Flooz. In February 1999, Hurst was named Netpreneur of the Year by InfoWorld, which said that "Mark Hurst has done more than any other individual to make Web commerce sites easier to use." He has bachelor's and master's degrees in computer science from MIT.

Mark Hurst also writes goodexperience.com, a daily site monitoring the online customer experience. To get Good Experience by e-mail each week, send an e-mail to update@goodexperience.com.