



# SMARTPHONES AND OTHER MOBILE DEVICES: THE SWISS ARMY KNIVES OF THE 21ST CENTURY

# *Web-enabled mobile devices help users become more effective, providing a variety of tools for different purposes*

By **Alan Livingston**

**B**y 2005, according to analysts, people will access the Internet more frequently from mobile devices than from desktop PCs.<sup>1</sup> This forecast may be ambitious, but there is no doubt that faculty, staff, and students are buying large numbers of mobile devices, bringing them to campus, and trying to use them for academic purposes. What does this mean for your IT division, and particularly for your Web development team? Your university's current Web site was almost certainly designed with desktop PCs in mind. Are you going to have to reformat thousands of Web pages to make them viewable on mobile devices? And are there other things you ought to be doing in response to the growing use of mobile devices? The answers lie in the nature of mobile devices and the way people use them.

Let's define an acronym. Throughout this article, MIAD will stand for "mobile Internet access device." "Internet access device" means a device capable of connecting to the Internet and communicating with other devices on the Internet (especially servers) using standard Internet protocols. "Mobile" means that the device is small enough to fit comfortably into a purse, pocket, or holster, so you can conveniently keep it with you at all times.

There are two major categories and one minor (and shrinking) category of MIADs. The two major categories are mobile phones and personal digital assistants (PDAs). The minor category is two-way pagers.

The prediction in the first paragraph probably includes tablet, notebook, and laptop PCs as well as these three categories of devices, but those devices aren't mobile in the way that mobile phones, PDAs, and pagers are. They don't fit comfortably into a purse, pocket, or holster, and you aren't

likely to keep them with you at all times. Browsing the Internet on a tablet, notebook, or laptop PC, moreover, is very much like browsing the Internet on a desktop PC, whereas browsing the Internet on a phone, PDA, or pager is very different. Developing Web content for tablet, notebook, and laptop PCs is therefore no different from developing Web content for desktop PCs, whereas developing Web content for mobile phones, PDAs, and pagers is quite different. For these reasons tablet, notebook, and laptop PCs won't be considered in this article. "MIAD" will be understood to refer to mobile phones, PDAs, and two-way pagers.

The next four sections will analyze the characteristics of these devices and the ways in which people use them. We will then return to the questions raised in the first paragraph.

## **Mobile Phones**

Mobile phones come in a wide variety of makes and models with a confusing array of features. For the purposes of this article, however, those mobile phones that qualify as MIADs (as defined above) may be grouped into three categories: (1) Web-enabled phones; (2) extensible phones; and (3) smartphones. The features that define these categories are cumulative; that is, extensible phones have all the features of Web-enabled phones, and smartphones have all the features of extensible phones.

Web-enabled phones have four sets of features:

- Voice
- Messaging
- Browsing
- Miscellaneous

Voice requires little explanation. Everyone uses phones for voice communication. Voice-related features include storage of telephone numbers,

voice messaging, and others.

In addition to voice, most Web-enabled phones have messaging capability. This includes text messaging—the ability to send a short store-and-forward text message to another phone. This is very popular in Europe, where "I'll send you a text message" is as common as "I'll call you" and where television programs invite viewers to "text" their comments to numbers displayed on the screen. In the United States, text messaging has not really caught on (yet).

Some phones (especially camera phones) have multimedia as well as text messaging capability—the ability to send pictures and sounds as well as text. This is being advertised heavily in both Europe and the United States. Also in the messaging category, most Web-enabled phones have some sort of e-mail capability, and some have instant messaging capability.

In addition to voice and messaging, Web-enabled phones have a microbrowser that enables them to access and display at least some Web content. The microbrowsers in some Web-enabled phones are Wireless Access Protocol (WAP) browsers. This means they access the Internet through a WAP server and can access and display only Wireless Markup Language (WML) content—in other words, content specifically encoded for WAP browsers and on WAP (rather than Web) sites.

WAP sites are characterized by text-only menus from which you make selections; these lead to submenus from which you make further selections and eventually to the information you are looking for. Any input required is very simple because of the difficulty of typing anything on a mobile phone keypad. People accustomed to full-featured Web sites are often disappointed by WAP sites, but

for specific items of information—such as weather forecasts, sports scores, or train departure times—they can be very useful.

Microbrowsers in some Web-enabled phones can access and display HTML as well as WML content. Because of their small screen size, however, WAP sites tend to work better than HTML sites even on these phones (unless you like to do lots of horizontal and vertical scrolling).

Web-enabled phones originally connected to the Internet using slow circuit-switched connections. Many users were disappointed by the long call setup times and slow data-transfer rates. Today, most Web-enabled phones use faster packet-switched connections.

In addition to voice, messaging, and browsing, Web-enabled phones often have calendars, calculators, games, and miscellaneous other applications. All mobile phones are miniature computers, and manufacturers load them with applications intended to appeal to consumers and increase sales.

Extensible phones have all the features of Web-enabled phones. In addition, they allow users to download and install software, thereby extending their functionality. The defining feature sets of extensible phones are therefore the following:

- Voice
- Messaging
- Browsing
- Extensibility
- Miscellaneous

There are two main groups of extensible phones. The first and most common are the Java 2 Micro Edition (J2ME) phones. The software of these phones includes an application management module and a J2ME virtual machine, which allow the phones to download, install, and run J2ME programs.

The second group of extensible phones are the Binary Runtime Environment for Wireless (BREW) phones. The software of these phones includes Qualcomm's BREW software. This allows them to download, install, and run programs developed for this environment.

Downloadable programs have several advantages over Web (or WAP) applications as a means of extending the functionality of mobile phones (and MIADs in general). First, they are faster. Second, they will work when the phone isn't connected to the Internet or when the connection is slow or intermittent. Third, once you have downloaded them, you can use them without incurring any further data-transfer charges.

The most readily available programs for both J2ME and BREW phones are games, but there is no reason why more business-oriented programs cannot be created as well, as long as the memory and storage limitations of the target devices aren't exceeded.

Smartphones have all the features of extensible phones. In addition, they include, as part of their standard software, the personal information management (PIM) functions of a PDA. PIM functions vary but typically include a calendar, an address book, a to-do list, and a notepad or memo function, all of which may be synchronized with a desktop PC or network server. The defining feature sets of smartphones are the following:

- Voice
- Messaging
- Web browsing
- Extensibility
- PIM functionality
- Miscellaneous

There are four major categories of smartphones: (1) those whose software includes the Palm OS and applications; (2) those whose software includes the Windows Mobile (formerly PocketPC) operating system and applications; (3) those whose software includes the Symbian operating system and applications; and (4) those whose software includes the Blackberry operating system and applications.

Palm smartphones, some Windows Mobile smartphones, and some Symbian smartphones have touchscreens with handwriting (or graffiti) recognition. This makes e-mail and other messaging applications easier to use. Blackberry smartphones have miniature keyboards for the same purpose.

There are, however, Windows Mobile and Symbian smartphones that are designed to work with a mobile phone keypad rather than a touchscreen or keyboard.

The extensibility of Palm, Windows Mobile, and Symbian smartphones is not limited to J2ME and BREW programming. Programs can be written for the operating systems included in these smartphones. This means that more third-party applications are available for these phones (especially for Palm and Windows Mobile smartphones, for which hundreds if not thousands of applications are available). It may also be easier to create useful enterprise applications for these phones.

Document readers and/or viewers are available for most smartphones. This makes it possible to extend their functionality by downloading and storing frequently used documents. This may be regarded as a second form of extensibility.

## Personal Digital Assistants

Like mobile phones, PDAs come in a variety of makes and models. For the purposes of this article, however, they can be grouped into two categories—those that run the Palm OS and applications (commonly known as Palm handhelds), and those that run the Windows Mobile OS and applications (commonly known as Pocket PCs). A third category—industrial handhelds—will not be considered in this article.

To qualify as MIADs, PDAs must connect to the Internet. Various Pocket PCs have built-in Wi-Fi (802.11) connectivity. Expansion cards are available for connecting Pocket PCs with appropriate expansion slots to either Wi-Fi or mobile phone networks. It is also possible for Pocket PCs to connect to mobile phone networks using a cabled, infrared, or Bluetooth connection to a mobile phone.

Connection options for Palm handhelds are more limited. Some have built-in connectivity to either Wi-Fi or mobile phone networks, and most can connect to mobile phone networks

using a cabled, infrared, or Bluetooth connection to a mobile phone. Expansion cards for connecting to mobile phone networks are not yet available, however, and the choice of cards and other devices for connecting to Wi-Fi networks is limited.

Once connected, PDAs have the same feature sets as smartphones, with the obvious exception of voice:

- Messaging
- Browsing
- Extensibility
- PIM functionality
- Miscellaneous

There are those who expect smartphones to replace PDAs. After all, smartphones have the same capabilities—plus voice—and enable you to carry a single device. This is not a universally held opinion, however. There are also those who dislike the size and shape of smartphones (at least the models marketed up to this point) and who prefer to carry two devices.

Mobile phones and PDAs have become the most commonly used MIADs. For a time, however, two-way pagers constituted a significant third category.

## Two-Way Pagers

Pagers were originally devices that allowed their users to receive text messages. In the mid-1990s, however, the Federal Communications Commission approved a return channel for paging networks, clearing the way for the development of two-way pagers—devices that allowed their users to send as well as receive messages. Motorola and Research in Motion (RIM) capitalized on this change by creating devices that could be used for e-mail. Not just for e-mail, however. Some of the devices also included microbrowsers and PIM applications and were programmable (extensible). For the purposes of this article, therefore, their feature sets were almost identical to those of PDAs:

- Messaging
- Browsing
- Extensibility
- PIM functionality
- Miscellaneous



RIM's Blackberry devices were the most successful two-way pagers. For several years, many corporate travelers kept tabs on their e-mail using one of these devices. In the past two years, however, as mobile phones have become increasingly ubiquitous, the use of two-way pagers has declined sharply. Motorola has stopped making its two-way pagers (although refurbished models are still available), and RIM has released voice-enabled devices that run on mobile phone networks rather than pager networks. (As noted above, I have classified these as smartphones.) Legacy devices continue to be used, but the future of two-way pagers does not look promising.

## Using MIADs

Not everyone who has a mobile phone or PDA uses it as a MIAD. Many people, perhaps most people, use their mobile phones exclusively for voice communication and their PDAs exclusively for scheduling appointments and have little or no conception of

what it might be like to use them as MIADs.

Those who do use MIADs use them in a wide variety of ways. Generally speaking, however, they use them in the way that people use Swiss Army knives—as devices that they remove from their purses, pockets, or holsters in specific situations to help them perform specific tasks.

If their MIAD is a Web-enabled phone, they'll get it out to make and receive voice calls. They may send text messages. If their Web-enabled phone has an e-mail client, they might also check their e-mail or send an e-mail message. They may use it for instant messaging. If it has a calendar, they might pull it out to schedule an appointment. If it has a calculator, they may get it out to help with a calculation. If they're waiting somewhere with nothing better to do, they might play a game.

They will also reach for their Web-enabled phones when they need to retrieve a specific bit of information

from a Web (or WAP) site or when they need to perform a simple Web-based transaction. It is important to note that MIAD users' use of the Web differs from desktop PC users' use of the Web. MIAD users don't "surf" or "browse" or "explore"—the small screens on their MIADs discourage this. Instead, they use the Internet to help them perform specific tasks. Each WAP site they bookmark becomes a new blade in their Swiss Army knife.

If their MIAD is an extensible phone, they'll use it for all of the above reasons. In addition, they will probably have extended the functionality of the phone by downloading and installing new applications. Each application downloaded and installed will become a new blade in their knife.

If their MIAD is a PDA, they won't be able to use it make phone calls, but they'll use it in all the other ways described above. They're more likely to use it for e-mail than Web-enabled and extensible phone users because the touch screen and stylus make entering text easier. In addition, they'll use it to manage contacts, schedule appointments, organize tasks, make notes, and keep all this personal information in synch with their desktop and/or groupware applications. They're also likely to have installed new applications to increase the functionality of their PDA. Each new application will become a new blade.

It is becoming less likely that their MIAD will be a two-way pager. If it is, however, they'll use it much like a PDA, although there won't be as many third-party applications to install. If their MIAD is a smartphone, finally, they'll get it out and use it for all of the above reasons.

Regardless of the type of device they carry, MIAD users tend to become increasingly dependent on it. They may find themselves getting it out more frequently, using it to help them perform more tasks. They find it making more and more contributions to their efficiency, effectiveness, and productivity, and they might begin to wonder how they ever got along with-

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out it. Eventually they begin noticing magazine ads, taking interest in the features of new phones and PDAs, and wondering if the latest model will help them become even more productive.

Everyone is different, of course, and not everyone goes to this extreme. Still, the metaphor of the Swiss Army knife provides a useful way to think about the way people use MIADs and the ways in which they benefit from using them.

### **Supporting the Use of MIADs**

We've looked at the characteristics of MIADs and how people use them. We're now prepared to address the questions raised in the first paragraph of this article. What does the growing use of MIADs mean for your IT division and Web development team?

On the one hand, it seems safe to say that you're not going to have to reformat all the pages on your university's Web site. As we saw in the last section, MIAD users aren't looking for the information-intensive kind of content you have on most of your Web pages. When they need to review descriptions of academic programs and the like, users will use a large-screen device.

On the other hand, the image of the Swiss Army knife is a compelling one. There are dozens of ways in which MIADs might be used to advantage by faculty, staff, and students. Calendar-ing is an obvious example. At Weber State University, as at most institutions of higher education, we have a groupware calendaring system. When you need to schedule a meeting, it is very convenient to search for a time when everyone is available. Unfortu-

nately, many faculty and staff don't keep their schedules on the system. The excuse they give is that they need to have their schedules with them when they're away from their computers. A MIAD with the ability to synchronize with the groupware calendar (and/or to access the groupware system over the Internet) would solve this problem. It would enable these users to keep their schedules on the system and access them when away from their computers.

Directory services are another example. I was in a meeting a year or so ago when a question arose that required an immediate answer from a programmer who was not in attendance. "Does anyone know his cell phone number?" the meeting's organizer asked. No one did, and a roomful of highly paid professionals marked time while someone left the meeting and looked up the number. If the organizer's cell phone had been a MIAD, and if our telephone directory had been available on a MIAD-accessible Web site, we could have moved ahead with our business more efficiently.

Later in the same meeting we were discussing the implementation schedule for a new system. The critical deadlines were during spring semester, and someone raised the question, "When is spring break?" No one knew, and we all waited again while someone left the meeting and found a copy of the academic calendar. Again, if anyone in the meeting had been carrying a MIAD, and if the academic calendar had been available on a MIAD-accessible site, we would have been able to work more efficiently.

These are small inconveniences, and the ability to avoid small inconveniences may not sound like a compelling reason for faculty and staff to use MIADs or for an IT division to allocate resources to support them. Inconveniences like these occur repeatedly, however, and it is the frequency with which they occur that gives MIADs their value. This value does not lie in their ability to run a single killer application. It lies (like the value of a Swiss Army knife) in the cumulative effect

of their ability to help you perform a variety of small but recurring tasks more intelligently and efficiently.

So why—if MIADs have such value—was no one in the meeting I just described carrying one? And why aren't faculty and staff rushing out to buy MIADs?

Unfortunately, there are obstacles to the effective use of MIADs in higher education, obstacles that prevent many faculty and staff from using them at all and that keep others from using them to full advantage. Your IT division can play a role in removing these obstacles and facilitating more widespread and effective use of MIADs.

One obstacle is the average faculty or staff member's limited conception of what is possible with a MIAD. You can counter this obstacle by conducting demonstrations and showing faculty and staff what they might do with a MIAD beyond making voice calls and scheduling appointments.

A second obstacle, and a serious one, is the difficulty of selecting a MIAD. There are so many devices available, so many options for connecting to the Internet, and so many service plans that it can seem next to impossible to make an intelligent decision. You can counter this obstacle by creating a short list of devices and plans you recommend and support. This will have the added benefit of making it easier for you to support these devices.

A third obstacle is the difficulty of configuring a MIAD to connect with your network, access your e-mail system, synchronize with your system's calendar and address book, and so on. You can counter this by preconfiguring the devices you support or by publishing information on how to configure these devices for use in your environment. You might also consider creating an infrastructure for server-based (rather than desktop-based) synchronization of MIADs.

A fourth obstacle is the inscrutability of many user's guides and the difficulty of learning how to use a MIAD. You can counter this obstacle by offer-

ing ongoing training related to the use of the devices you support.

A fifth obstacle is the disappointment some users experience when they discover that using e-mail on a MIAD isn't like using a desktop e-mail client and that using WAP sites with a microbrowser isn't like surfing the Web on a desktop PC. You can counter this letdown by helping users form realistic expectations in your demonstrations and training.

In addition to removing obstacles, there are things you can do to extend the functionality of MIADs. One would be to create a Web site with applications suitable for use on a MIAD. Like other mobile Web sites (or WAP sites), this would be a text-only menu (perhaps organized by categories of users) of applications you judge to be useful to MIAD users. Each application would extend the functionality of a user's MIAD, adding a new blade to that Swiss Army knife.

In addition to creating a mobile Web site, you could create downloadable programs or documents to extend the functionality of the devices you have chosen to support. A downloaded academic calendar, for instance, would have the advantage of working in locations where an Internet connection is not available. Like a mobile Web application, this would add one more blade to the user's Swiss Army knife.

At Weber State University, the IT Division has formed a project team to improve the support we provide for the use of MIADs. The team includes staff from the division's Telecommunications, Systems and Network Management, Computing Support, and Web Development departments. The composition of the team is important, as each of the participating departments has a role to play in supporting the use of MIADs.

The team has nine goals. The first and last goals will be pursued by the project team as a group. In each of the other cases, I have indicated which of the participating departments will assume primary responsibility for accomplishing the goal or providing

the service. The goals are as follows:

- Identify a limited number of MIADs to brand and preconfigure as official WSU smartphones or PDAs. This will include selecting service plans and means of connecting to the Internet (where required), as well as choosing the devices themselves.
- Extend the functionality of the selected MIADs by creating a mobile Web site. While preconfiguring the MIADs, make this the microbrowser's default Web site, or at least bookmark it. (Our Web Development department will assume responsibility for creating our mobile site.)
- Further extend the functionality of the selected MIADs by creating downloadable applications or documents. Install these applications or documents while preconfiguring the MIADs. (Our Web Development department will create these applications or documents.)
- Create an infrastructure for server-based synchronization of the selected MIADs. (Our Systems and Network Management department will accomplish this goal.)
- Prepare a supplementary user's guide for each selected MIAD. This will explain how to configure the device to connect to the university's network, access the e-mail system, and synchronize with the system's calendar and address book—everything the user needs to know about using the device in the WSU environment. (Our Computing Support department will assume responsibility for producing these guides.)
- Promote adoption of the selected MIADs by conducting demonstrations, making recommendations, and publishing the list of recommended devices on the Web. At the same time, try to avoid creating unrealistic expectations. (Our Computing Support department will conduct the demonstrations. Our Web Development department will publish our list of recommended devices on the Web.)
- Deliver branded, preconfigured MIADs to users who order them.

Brand the devices (to the extent possible) by changing wallpaper and/or icons to give them a customized WSU appearance. Preconfigure them to connect to the Internet, access the e-mail system, and synchronize with the system's calendar and address book. Install appropriate applications and/or documents. Set the university's mobile Web site to be the microbrowser's default page. (Our Telecommunications department will provide this service.)

- Provide ongoing training for owners of supported MIADs; also be prepared to provide individual help. (Our Computing Support department will assume responsibility for providing this service.)
- Evaluate new MIADs as they are released to keep the list of recommended MIADs current.

The initial emphasis of the WSU program is on providing support for the use of MIADs by faculty and staff. In the future, some elements of this support may be extended to students.

It is unlikely, given the limitations of our resources, that we will preconfigure devices for students, as we intend to do for faculty and staff. It is likely, however, that we will create a mobile Web site for students, and it is possible that we will create a way for them to synchronize their MIADs with the university's student e-mail and calendaring system.

It is too early to evaluate the success of this program, but the formation of the team has given a focus to our efforts to support the use of MIADs. This move promises to produce a level of support far superior to the informal and fragmented support we have provided in the past.

Your institution no doubt differs from WSU. Your IT division has different resources, and you will probably make different decisions about supporting the use of MIADs. I hope, however, that this description of the WSU project, combined with the preceding analysis of the characteristics and use of MIADs and the obstacles to

their use in higher education, will provide a starting point for conceptualizing the kind of support you might want to provide.

## Conclusion

MIADs are the Swiss Army knives of the 21st century; they help users perform specific tasks in specific situations (including academic tasks in academic situations), thereby making users smarter and more productive. There are, however, significant obstacles to their effective use in higher education. IT divisions have an important role to play in removing these obstacles and helping faculty, staff, and students use MIADs to full advantage. *e*

## Endnote

1. M. Beaulieu, *Wireless Internet Applications and Architecture* (Boston: Addison-Wesley, 2002), p. 3.

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