What is a Personal Digital Assistant?

A personal digital assistant, or PDA, is a small, handheld device that provides tools to enhance personal productivity. Primary tools usually include a calendar, a task list, a contact list, and notes. A basic PDA can easily replace a paper-based planner. Most PDAs allow for the addition of many other software tools in addition to the basic ones. Most PDAs will have a companion desktop tool set along with the ability to sync the PDA with the desktop computer, thus enabling the desktop as a safe repository of the PDA data and enabling the PDA as a mobile device that you carry around with you. Newer PDAs are coming enhanced with wireless communication capabilities. PDAs can also run various stripped-down computer applications, such as word processors and spreadsheets, and the data can be moved back and forth between the PDA and the desktop.

PDA vendors include Palm, Handspring, Compaq, HP, Casio, Research in Motion, and others. Most PDAs use either the Palm OS or one of the Microsoft operating systems for handhelds, Windows CE for PDAs with keyboards and PocketPC for PDAs without keyboards. Other software vendors, such as Sun Microsystems, provide development tools for PDAs. Handango provides downloadable applications, and Avantgo provides information that is downloaded automatically when the PDA syncs with the desktop. Many other sites distribute applications for PDAs, some commercial, and some freeware or shareware.

Why Will PDAs Be Important to Higher Education?

At the most basic level PDAs can serve as a replacement for the paper planners that so many faculty and staff use to keep themselves organized. They make it easier to keep your calendar up-to-date, especially for those of us who have someone scheduling events for us while we are out. Although PDAs are more costly than a basic planner, at least initially, the costs even out over time when you buy more of those paper inserts for your planner.

It is less clear what roles the PDAs may come to play in the main business of colleges and universities: educating students. PDAs enhanced with wireless, together with a wireless classroom, may provide a lower-cost solution to accessing web-based instructional materials during class, although in their current form, PDAs are limited by the small screen size. For students, they also serve as a productivity tool, and some of our students can certainly benefit from learning better organizational skills. The capability of PDAs to run simple versions of office productivity tools adds to their usefulness. At my campus, Jim Allert of the Computer Science Department has developed applications for the iPAQ using desktop tools. Students can then download these applications to their iPAQs, and Jim uses these examples as the basis for discussion.

A wireless-enhanced PDA on a campus with a wireless network becomes a device that can access email as well as the web. While a PDA is not a replacement for a personal
computer or a laptop, it is smaller and more mobile, thus making it an excellent device for filling in when a computer isn't handy. As more applications for PDAs are developed, we may find even more uses for them in our educational environments.

When Will PDAs Become Major Technology Tools on Campuses?

PDAs are already on our campuses, primarily in the hands of faculty and staff, especially the early adopters who love new toys. If you haven't noticed yet, you soon will notice that your technical staff are fielding lots of questions, mostly about syncing to desktops and to campus servers. Some of these problems can be so messy that they consume lots of staff time and never really work properly. For example, to get my Palm to sync with our campus calendar server, I had to load Virtual PC on my Mac and set up a calendar conduit through Virtual PC. Even this failed to sync my calendar properly, as well as freezing my desktop as often as not, so I finally gave up and kept my two calendars up-to-date separately. The good news is that the latest version of our calendar software came with a Mac client, which allowed me to bypass the Virtual PC. This works much better. As with most new technology, it comes with lots of warts in the beginning, but with so many smart people working on these problems, it's bound to improve.

A number of colleges and universities are experimenting with ways to use PDAs in education. The College of Science and Engineering at my own institution, the University of Minnesota Duluth, requires all incoming freshmen in engineering and computer science this fall to have a Compaq iPAQ device. The University of South Dakota provides Palm PDAs to all first-year undergraduate students as well as first-year law and medical school students, beginning in fall 2001. The School of Computer Science at Carnegie Mellon has launched the Pebbles PDA Project to study how PDAs can be used in conjunction with personal computers and other devices. East Carolina University has a project with 125 students using Handspring Visor devices involving six courses in multiple disciplines. The University of Delaware is designing their campus portal to be friendly to PDAs. George Fox University was granted a proof-of-concept award from NWACC entitled Palm Professor: using handheld technology to enhance teaching and learning. Virginia Commonwealth University has a number of PDA projects, mostly medical. Wake Forest University has several projects with PDAs, including a party management system that uses a Symbol scanner-equipped Palm to check students into parties via the campus wireless network. Out of these projects and others, higher education institutions will develop the experience that will show us how PDAs can be used effectively in our environments.

How are PDAs Evolving?

PDAs started as an interesting blend of an older paper technology (daily planners) and a new mobile technology (laptop computers). They are smaller and more portable than both of their predecessors. Some PDA manufacturers are already producing add-ons to convert the PDA into a cell phone. Cell phone manufacturers are finding ways to provide email and web access through their cell phones. PDAs may have the edge here with their larger screens. For the busy professional who wants to use phone, email and web regardless of location, this converging solution is quite exciting.
PDAs can communicate wirelessly in several different ways, and it is important that campus IT personnel understand this, as it will affect how you choose to deploy wireless on campus. There are three levels of communication for PDAs: the personal area network, the local area network, and the wide area network.

Most PDAs can already communicate with one another by beaming information between their infrared ports. If Bluetooth or some similar short-range wireless technology is widely implemented in devices, we may be able to eliminate the syncing cradles used now and simply send data between our desktops and our PDAs wirelessly. This is communication at the personal area network (PAN) level. The idea is to eliminate cabling devices altogether. Similarly, we should expect our PDAs to be able to communicate wirelessly with printers and projectors.

At the local area network (LAN) level, the PDA needs to connect to the campus network. Probably most of us will do this by installing wireless access points (WAPs) on our campuses and connecting those to the campus network. Then the PDA communicates wirelessly with the WAP, which is part of the campus network. The 802.11b wireless protocol is the standard for this type of communication, and a number of vendors are already providing these access points. Authentication is an important issue here that is not yet easy to implement with all PDAs. Network gurus may object to the step back in terms of bandwidth: after converting to switched networks where each device gets dedicated 10 Mbps, wireless takes us back to the hub model, where all devices accessing the hub (or WAP) share 11 Mbps. A number of vendors are testing the faster 802.11a wireless protocols, which can transmit data at up to 54 Mbps.

Finally, to get wireless access for your PDA when you are traveling, you will need to access a wide area network, most probably one provided by a commercial vendor. Certainly some commercial vendors will be eager to provide your campus LAN access as well as WAN access. This may be feasible for a small number of PDA users, but a commercial rate of $35 to $50 per month per device will probably not scale well for hundreds or even thousands of students. Commercial WANs are not yet as well developed in the United States as they are in Europe. There are many pockets where there is no coverage at all, and no matter what commercial vendor you go with, you are likely to find areas in the country where you cannot get any access. We can expect this to change as wireless services continue to grow, both for cellular phones and for PDAs.

As PDAs evolve, we can expect to see both their form and their function change. There are already some PDAs designed for use in field work; they are designed to be resistant to shocks, water, and other kinds of hard usage. At Wake Forest University, researchers in the Biology Department are using Palm devices to record observations in the field. At Oklahoma State University, researchers use the mapping capabilities of the PDA together with global positioning capabilities. This tool is useful in a variety of disciplines, from civil engineering to landscape architecture. PDAs are also being used in medical applications for monitoring and gathering data.

The PDA itself can be considered to be a wearable device if you notice the number of folks carrying them around on belt loops. But to have a wearable device that is usable while it is being worn, we'll need to expect major changes in form. The next step is a device that is implanted in the human body in some way. See reference sites below for several examples of research labs that are experimenting with wearable and implantable devices.
Issues to be Addressed

Campus IT units should begin thinking about how they will support PDAs before they are overwhelmed by support issues. Setting a campus standard can help if you can establish one, but as long as different vendors provide different features, you can expect strong proponents for each available brand. Competition between different operating system vendors will reduce the likelihood of standardization, making technical support more difficult.

If you decide to provide wireless access for PDAs, there is a whole set of issues around this, including who manages the air space and the wireless network, and how to implement authentication. Carnegie Mellon University has been a leader in wireless networks and in the related policy making. See the reference sites below for a link to CMU’s Project Wireless Andrew.

Desktop support for syncing PDAs with campus resources can be significant. Commercial vendors, such as Avantgo, provide services that can be delivered over the Internet to the PDA via the cradle, but problems with these services can also impact support staff. Most important of all, if PDAs are to become truly useful tools for higher education, we need to find serious educational applications for them.

Reference Sites

Products and Vendors

http://avantgo.com/frontdoor/index.html
http://www.casio-usa.com/personalpcs/
http://www5.compaq.com/products/handhelds/
http://www.handango.com/
http://www.handspring.com/
http://www.hp.com/jornada/
http://www.microsoft.com/mobile/pocketpc/default.asp
http://www.palm.com/
http://www.rim.net/
http://java.sun.com/products/personaljava/
http://java.sun.com/j2me/
Product Reviews and Comparisons

http://www.consumersearch.com/www/electronics/handheld_computers_pda/
http://www.howstuffworks.com/pda.htm
http://www.zdnet.com/pcmag/filters/guide/0,10172,6001651,00.html
http://www.zdnet.com/pcmag/stories/reviews/0,6755,2684563,00.html
http://www.zdnet.com/special/filters/sc/pda/

Handhelds, Telephones, and Wireless

http://www.pc-ephone.com/

Campus Projects

http://www.d.umn.edu/cse/
http://www.d.umn.edu/~jallert/cs1511/
http://chronicle.com/free/2001/05/2001050301t.htm/
http://www.usd.edu/urelations/news/archives/2001/May/may01.html
http://www.cs.cmu.edu/~pebbles/
http://www.educause.edu/ep/ep_item_detail.asp?ITEM_ID=31
http://www.ecu.edu/handheld/
http://mis105.mis.udel.edu/ja-sig/uportal/
http://www.georgefox.edu/palmpof/
http://www.wfu.edu/~anne/partyhtml.htm
http://www.cmu.edu/computing/wireless/
Wearable and Implanted Devices

http://www.technologyreview.com/magazine/jan01/tr10_nicoletis.asp

http://www.technologyreview.com/magazine/mar01/hawley.asp

http://www.cs.cmu.edu:80/afs/cs.cmu.edu/Web/People/hcii/Research/Projects/CollaborativeOnsiteWearable.html

http://www.wearablegroup.org/

http://www.wired.com/news/business/0,1367,40194,00.html

Advanced Research

http://www.technologyreview.com/magazine/sep00/freedman.asp

http://gonzo.media.mit.edu/public/web/group.php?id=41