



From the Editor in Chief

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People First, Computers Second

Roy Want

Having worked in the computer industry for almost 27 years, I sometimes forget that many other professions don't revolve around computers at all. Healthcare is a good example—its primary purposes are to make sick people well and to keep healthy people healthy. For arguably as long as there have been people, healthcare has been successful without computers, and could happily continue to be so. As a computer scientist, when I consider traditional work practices in hospitals, I assume that healthcare professionals could perform their duties better with support from appropriate information technology. Of course, a trip to most hospitals today reveals that they already widely use computers to record patient notes, store test results, and schedule appointments. But do hospitals use computers in the most effective way? Do they fully integrate computers into work practices that help rather than hinder the profession's primary goals?

Computers have some clear advantages over people: They perform computations quickly, accurately, and consistently—even when processing large amounts of data. Furthermore, when combined with communication networks, digital information can be rapidly transferred and made widely available to people across large distributed organizations—for example, a hospital campus. On the other hand, doctors are

better at diagnosis and inference than computers, and they can easily integrate new and varied information to build a more complete picture of an illness while making a diagnosis. And above all, doctors are interested in their patients' well-being. In fact, a keen interest in helping people is the primary reason many joined the profession to start with. Successful healthcare workers generally have good personal-interaction skills,

Many older staff members didn't adopt a healthcare career with the expectation of using computers.

while good computer systems designers in general do not excel in this area.

Therefore, it's perhaps unsurprising that bringing these two worlds together could result in systems that are built around differing expectations. In short, rather than designing people-centric systems, they end up computer-centric instead. This highlights Mark Weiser's statement that successful ubiquitous computing technologies "weave themselves into the fabric of everyday life until they are indistinguishable from it." At present, we haven't successfully integrated computing into healthcare in the ubiquitous sense.

TECHNOLOGICAL OBSTACLES

The gulf between healthcare needs and ubiquitous computing systems is something my wife, Sue, frequently reminds me about. A physical therapist, she learned her profession before personal computers became commonplace, using written notes and records to perform her work while focusing on quality face-to-face interaction with patients.

I recently asked her opinion about this topic:

"Getting my patient care done well is very important to me. That's what I view as my job. When I've completed my patient care tasks, I've used all my available physical and emotional energy. Then I'm expected to spend the last 30 to 60 minutes of my day with computerized charting, billing, and scheduling. This doesn't appear important to me; after all, I've done my physical therapy work, so I feel done for the day. To then start wrestling with a computer is an unwanted task, and a perpetual frustration, as this interaction does not match my physical therapy skill set."

From Sue's perspective, the introduction of computers in the hospital environment isn't the utopian use of pervasive computing that we imagined when sit-

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ting in our research labs.

As it happens, the hospital Sue works at has many additional computer hurdles that must be overcome, some of which are necessary for strong computer security and associated password management. The US Congress enacted the Health Insurance Portability and Accountability Act (HIPAA) in 1996, making the privacy and security of medical records and their associated electronic transactions a legal requirement. For workers, the security requirement is compounded by the need to deal with several independent computer systems. For example, Sue has a login name and a password to access her work email; for security reasons, she must change the password every six weeks. To access the scheduling system, she has a system-assigned login name and another password that she must change every eight weeks. She has a different login name for accessing the patient charting system and yet another password, which also changes every few weeks. Only occasionally do the passwords change at the same time, and Sue can seldom remember the current set. So, she writes the entire list of login names and passwords on a piece of notepaper and carries it with her as she visits patients throughout the hospital.

I'm sure this wasn't the system designers' intention, but it appears necessary given the way the systems have been realized. The IT administrators haven't simplified even the most rudimentary steps to allow these systems to be used in an integrated way. The software components appear to have been developed and introduced separately—and, for economic and historical reasons, they weren't combined, resulting in the current situation. This is at odds with our usual research view of applied computing, in which we assume we're designing from scratch and the applications will meld together synergistically.

THE RESULTING FRUSTRATIONS

So, what's the anecdotal commentary about the effect of computing on the medical staff? A common sentiment is that people felt professionally competent

before the hospital started using computers, and now they often feel incompetent at routine tasks. This depends somewhat on the number of years spent in the profession. Younger members of the staff can learn new systems quickly, but this isn't always the case for the established professionals. In fact, computer systems seem to be changing all the time (and likely will continue to do so for the foreseeable future), creating inefficiencies as people mature in their career. Many older staff members didn't adopt a healthcare career with the expectation of using computers, so they're often unenthusiastic about learning to use them.

Efficient keyboarding is also assumed for console-based computers, but not all the staff necessarily have this skill—and for some, typing anything takes much longer than using a pen and paper.

RECOGNIZING SOME BENEFITS

On the upside, Sue tells me that every now and then she's pleasantly surprised to find something useful that a computer can do. With every patient's electronic record available to her from any computer in the hospital, she can sit in one location to gather information about her caseload at the beginning of the day, without having to walk to each floor and look at each patient chart separately. This also cuts down on wasted trips to see a patient and then finding out that he or she isn't available because, for example, the patient is in dialysis or requires a blood transfusion before further treatment.

One implicit benefit of computing is in the realm of patient notes. Doctors don't go into their profession on the merits of their handwriting, and with computerized charting, nursing staff can read information more accurately. This could reduce the number of unfortunate incidents when poor handwriting is misinterpreted.

My conclusion, admittedly from a distant standpoint, is that we must take more care when planning and rol-

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FROM THE EDITOR IN CHIEF

EDITORIAL BOARD TRANSITIONS



In this first issue of 2007, I am very pleased to announce that Jason Hong (Carnegie Mellon University) will be joining our editorial board. He's also taking over as the Conferences editor at midyear. I thank Mary Baker for five years of excellent department articles that have been a regular feature of our publication since the first issue in 2002.

ling out computing in healthcare institutions. This is perhaps a challenge for pervasive computing research to address head-on, given that a distributed system of traditional computers appears to have many associated ease-of-use problems in these environments. Perhaps an electronic stylus would be a better match for the healthcare profession than a keyboard. The tablet computer design, which has had many false starts since the early '90s, could eventually become effec-

tive enough that healthcare organizations become avid adopters. Access and security mechanisms are still issues in healthcare, but the research literature already describes many engineering solutions that are applicable to this area. Electronic bracelets using encapsulated RFID tags might solve some usability problems and can identify both staff and patients for security and validation purposes.

Better system integration is also needed to overcome security problems, but this

isn't something that research can address per se—it's really an issue for software vendors. Perhaps our various research organizations could establish showcase examples of how software vendors should be designing these systems. Hospitals could then use them to demonstrate the desired behavior—which would become a requirement for any product before a hospital entered into a business commitment.

Healthcare has the potential to be a well-matched application domain for pervasive computing, but only if the two are merged with due consideration. This is a challenge that our research community could do more to embrace. Industry has already recognized the opportunity, with companies such as IBM and Intel dedicating complete business units to the cause. ■



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