

LETTER FROM THE EDITOR LARGE SCALE COMPUTING AND THE TECHNOLOGY CURRICULUM

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The pending retirement of the baby boom generation is predicted to cause dramatic alteration in our lives. Increasing health care costs, the transformation of the Social Security system, and major changes in institutional knowledge in organizations are just some of the implications of this demographic shift.

One of the many aspects affecting business and technology education is departure of mainframe computer analysts, programmers, and operators from the workforce. This has already begun to have an effect on companies such as IBM and Blue Cross Blue Shield. Wait a minute, you are saying. Aren't mainframe computers dead or dying? Why don't these companies just replace these antiquated systems with modern technology? That would solve the brain drain problem.

Well, the mainframe is not dead or dying. In fact, it is not even feeling poorly. According to IBM, all of the top 25 banks world-wide run mainframes, as do 23 of the top 25 U.S. retailers and 9 of the top 10 global insurance companies. Of the U.S. Fortune 500, 64% use mainframes; in the global Fortune 500, the proportion is even larger at 71%. In total, 80% of the world's corporate data exists on mainframes ("Why IBM," 2006).

Why have companies continued to use large scale computers, despite the ubiquity of microprocessor-based servers? The ability to process large numbers of transactions, tens of thousands per second, is one reason; lower cost per user is another ("Why IBM," 2006). Other reasons include more robust security, longer time between failure, and the ability to manage workload efficiently (Kahn, 2006). These attributes have been characteristic of mainframes since the 1980s. As microprocessor technologies

continue to improve, however, how will mainframes be able to keep up?

Three fairly recent developments are making large scale computers more attractive to businesses: open systems, virtualization, and the green data center. When people think of mainframes, they think of user-hostile operating systems like OS/MVS and legacy programming languages like COBOL. Today's mainframes run Linux and can be programmed in Java, however, making a lot of the same applications running on smaller servers available on large systems. The mainframe world is no longer restricted to proprietary software (Kahn, 2006).

One of the hottest trends in computer systems management is virtualization, the installation of multiple instances of operating systems on a single computer. This allows one computer to appear to be several computers to users. Virtualization simplifies server management and reduces the number of computers needed by an organization. Mainframe computers pioneered virtualization in the 1980s with IBM's VM/SP (Virtual Machine/System Product). A large scale computer today can simulate thousands of individual servers through virtualization ("Why IBM," 2006), reducing the complexities of server management and lowering costs.

For many people, the image of a mainframe computer is a complex of dozens of refrigerator-sized cabinets containing tape drives, disks, processors, and communications hardware located in a freezing room, consuming enough electricity to power a small city. Energy

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requirements for today's large scale computers are remarkably smaller, however, and server rooms containing rack upon rack of microprocessor-based systems are energy sinkholes, as well. IBM is leading an industry initiative to reduce energy consumption in data centers, based on virtualization, more efficient hardware, and energy management software ("IBM unveils plan," 2007). Innovations like these will spur the adoption of large scale computers to replace data centers full of hundreds of smaller servers.

Although large scale computers have continued to be used by organizations around the world, courses about these systems have largely disappeared from university curricula. Computer operations courses, once common, are gone. Computer architecture classes are focused on microcomputers. Operating systems classes cover mainly Windows and the Unix variants. Students are graduating with little knowledge of, and no experience with, mainframe computers. Coupled with the pending retirement of the older generation of mainframe professionals, a staffing crisis is looming for many companies.

Several colleges are teaming with IBM to offer coursework on large scale computing (MacFarland & Kahn, 2004). IBM has worked with faculty members to develop teaching materials ranging from single lectures to entire semester-long courses. These materials are available free of charge to faculty who join IBM's Academic Initiative (<http://www-304.ibm.com/jct09002c/university/scholars/academicinitiative/>). IBM has also created a contest called "Master of the Mainframe," in which college and high school students can win prizes for completing exercises using mainframe computers (<http://www-304.ibm.com/jct09002c/university/students/contests/mainframecontest2007.html>). Students today lack many of the attitudes towards mainframe technologies held by their elders, and view large scale computing as just another computer system. If IBM succeeds in selling the mainframe as the new "green" technology, it may become more attractive to students than microcomputer-based server systems.

Business and technology educators are used to having new technologies drive changes in

curricula. With large scale computing, the combination of "old" technology and a demographic shift is causing faculty members to rethink the importance of the mainframe for instruction in the 21st century.

IN THIS ISSUE

The articles in this issue of *Information Technology, Learning, and Performance Journal* share a theme: What are the attitudes of potential employees, employees, and employers about aspects of information technology? John Ballard and Mary Ann Edwards, of the College of Mount St. Joseph, and their coauthor Karen Scales of the State of Ohio Bureau of Workers' Compensation, surveyed women attending career transition workshops to examine their attitudes toward information technology (IT) careers. They found the women had mostly positive attitudes, but had some concerns about the male-dominated IT workplace. The authors call upon employers and educators to emphasize the creativity, problem-solving, and variety of IT careers when marketing to potential women employees.

Diane Davis and Belle Woodward of Southern Illinois University, Carbondale, surveyed over 200 graduates of their IT program to determine what skills they viewed as important for success. Among the technical skills they identified were end-user support, software installing, information management, and hardware maintenance. Nontechnical skills were also critical, however. These included critical thinking, the desire to learn, teamwork, and communication, among others. Findings like these are important to communicate to students in our programs.

Tom Dillon and Daphyne Thomas of James Madison University surveyed over 1,000 members of the general public to discover the extent of their knowledge about the use of e-mail in the workplace. They found considerable differences among different kinds of employees in their awareness of their companies' policies about e-mail, and many were unaware of their employers' abilities to monitor and examine employee use of e-mail at work. Clearly, both companies and educators need to do a better job

of explaining the limitations on the privacy of electronic communications.

Finally, Claire McInerney and her colleagues Nicole DiDonato, Rebecca Giagnacova, and Angela O'Donnell at Rutgers University looked at why students choose IT-related majors. Many influences were important, including positive experiences in high school, interest in computing, aptitude for math and physics, job prestige, the expectation of a good salary, the encouragement of family members, and the influence of a teacher or supervisor, among the students they interviewed. Many of these factors are beyond the control of postsecondary educators, but perhaps faculty members can identify students with interest and aptitude and provide the critical encouragement that will recruit students into technology majors.

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