# Jobs, Trades, Skills, and the Profession

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Recently, I got an e-mail message from someone who assumed I wrote the June column ("Using Computers in Our Daily Life," *Computer*, June 2002, pp. 104, 103). This person took issue with the statement that those who "remain tied to the past and refuse to adopt digital technology … can expect nothing but poverty." That Ana Asuaga, the June column's author, lives in Uruguay, a Third World country, gave a particular edge to that assertion.

This e-mail came from the US, where its author benefits from a First World environment and skills: He writes his own software, maintains Web pages, exposes security holes on the Internet, and rescues computers from dumpsters so that he can refurbish them. Yet he cannot get a job in the computing field, complaining bitterly that "just because you have a ton of computers and can program them doesn't mean jack squat."

**Is the reputed shortage of IT skills a political scam or is the computing profession itself at fault?**

## IT SKILLS SHORTAGE

Such a plaint might, in the absence of further information, suggest that some aspect other than talent and experience makes this person unemployable. However, shortly after receiving this message, I chanced on a column by the highly respected Australian technology journalist Graeme Philipson ("IT Skills: A Shortage or a Scam?" *The Age*, 18 June 2002; http://www.theage.com.au/articles/2002/06/15/1023864366686.html). Philipson sees the IT skills shortage as nothing less than a political scam.

So do many of his readers, who contributed to a response he describes as by far the greatest he has experienced in 20 years of writing about IT ("Testimonials Put the Lie to the Myth of the IT Skills Shortage," *The Age*, 16 July 2002; http://www.theage.com.au/articles/2002/07/15/1026185154255.html). All but one of his more than 250 respondents agreed with Philipson—those he quoted echoed the sentiments of my own irate reader.

Nor is this solely an Australian phenomenon. Certainly, Norman Matloff's testimony to the US House Judiciary Committee's Subcommittee on Immigration ("Debunking the Myth of a Desperate Software Labor Shortage"; http://heather.cs.ucdavis.edu/itaa.real.html) indicates that the situation is much the same in the US. Further, the main government measure to counteract the supposed shortage—encouraging people with IT skills to emigrate from less-developed countries—is common to both Australia and the US, and it also seems to be popular in Western Europe.

Who is behind this myth? In his June column, Philipson suggested that "many in the IT industry are manufacturing fears of an IT shortage to get handouts from government and to be able to hire cheaper immigrant labour." And in the US, an H-1B Hall of Shame lays blame similarly (http://www.zazona.com/ShameH1B/).

Blaming the IT industry or a servile government for this deceit is unfair. The main fault lies with the computing profession.

## IT AND THE PROFESSION

Information technology concerns itself with processing data, particularly digital data. The computing profession takes this activity to be its special bailiwick.

But what kind of a profession are we? We can lay some claim to being a branch of engineering. The various engineering branches exist to exploit technically physical materials and other resources. Civil engineering exploits materials in static structures, mechanical engineering exploits kinetic energy, and electrical engineering exploits electrical energy. The computing profession exploits data: conventional representations of facts or ideas.

The computing profession and traditional engineering branches differ in two respects: their professionals' responsibilities and the nature of the resources they exploit.

### Professional responsibility

In traditional branches of engineering, professionals lead and take respon-

*Continued on page 102*

*Continued from page 104*

sibility for the work of those skilled in particular trades:

- civil engineers oversee machine drivers and concrete workers,
- mechanical engineers oversee machinists and other metalworkers, and
- electrical engineers oversee riggers and electricians.

In traditional engineering, professional work is clearly and formally distinct from construction work and from the work the constructed products' users do. Not so in the computing profession. Where segregation of this kind exists, it is local and informal. The computing profession seems instead to want to separate into branches, each of which engineers a specific type of system: information, computer, software, knowledge, and so on.

Industry generally sees the computing profession as a variegated and vacillating collection of leaderless skills. That's why industrial leaders can rant about IT skills with little fear of contradiction—they see no clear structure because the profession itself sees none.

Engineers and tradespeople have distinct and essential roles. Engineers lead by bringing their education and experience to bear when applying general principles to new problems. Tradespeople carry out assigned tasks using a variety of tools and techniques coupled with skills acquired through training and experience.

General principles are stable and only slowly extended, and engineers apply those principles continually to develop new tools and techniques for using them. Thus, training and continual retraining are much more important for the tradespeople who use those new tools and techniques than for the engineers who develop them. In many countries, specialist schools for technical or vocational education supply this training. If they were better supported in specialist areas of computing by the profession, and if computing professionals were prepared to lead computing tradespeople, any real shortage of particular IT skills would be short-lived.

If the computing profession recognized and encouraged the development of computing trades, we would have little need for separating the profession into branches, and the education of computing professionals could be redeveloped along generalist lines, perhaps even as a unified data engineering discipline. Let's face it, programming is a craft and trade, not a profession.

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## The secondary profession

A data engineering generalist would seek to exploit data. As a resource, data and the machines that process data differ in kind from the resources and machines that other engineering branches exploit. Engineering's traditional branches exploit resources and phenomena derived from them, such as structural materials and kinetic and electrical energy.

Data, on the other hand, subsists in immaterial representations *imposed on* material derived from natural resources. Data is thus a secondary, indirect, and limitless resource that all professions and occupations use. Indeed, humanity has based its civilization on the formal use of data.

Although we once could imagine a profession distinguished from others by its exclusive use of digital computers, this notion is now ludicrous. Yet computing professionals continue to talk loosely of the *computer profession*, a phrase echoed in the "Innovative Technology for Computer Professionals" tagline that, unfortunately, appears on this publication's front cover.

All professions—and those who educate their practitioners—will increasingly depend on machines based on digital technology. Therefore, educators should teach future computing professionals more than data engineering. They should educate students to accept and promote their profession as secondary: one that aids and abets other professions. The students' education should include project work carried out in cooperation with students from other professions. To survive and flourish, the computing profession must abandon the idea of living in splendid and oracular isolation.

We *do* need a branch of engineering devoted solely to the design and manufacture of digital computers, which might well be called computer engineering. But computer manufacturing's oligarchic nature means that the field will need relatively few such computer engineers, so their professional education and affiliation would be better regarded as a specialization within electronic engineering.

## BEYOND PROFESSIONS

Digital machinery is rapidly coming to dominate upper- and middle-class domestic life in developed countries, most significantly in entertainment applications. In such an environment, children receive a significant amount of computer and Web training during their daily activities. Many occupations will rely increasingly on using computers and computer-based machinery, and training in the vocational use of computers and such machines—training distinct from that of computing tradespeople—should be demanded by the relevant trade organizations.

Using appliances based on digital computers lies beyond the computing profession's proper concerns. Using computers to compute does not. The profession has a responsibility to promote and support the effective and knowledgeable vocational and domestic use of computation. It should thus give attention to how marketing objectives dominate such computation.

Ordinary users and their teachers feel flummoxed by the ever-growing complexity of the personal computers, oper-

ating systems, and software suites they must upgrade continually. If the automotive industry behaved as the computer industry does, it would sell in place of the private car an articulated 18-wheeler containing a bathroom and private theater, with an automatic transmission supplemented by a 233-speed manual gearbox necessary for curves and hills. We desperately need a program suite that combines *basic and stable* spreadsheet, database, document, and graphic processing under a *basic and stable* operating system on a *basic and stable* personal computer. With such a foundation, *all* children and apprentices might effectively learn persistently useful skills. The digital divide might then start narrowing rather than continuing to widen. Further, if we could make available *basic* RPG, Cobol, and Fortran in the simple style of the 1960s, many more young people might learn to do their own programming.

All this talk of IT skills masks a deception: The phrase itself suggests that such skills form some kind of esoteric capability distinct from all others. The computing profession should assert most vigorously that everyone should possess the skills to deal with data effectively. Basic education should have this aim. After all, we expect schools to inculcate literacy and numeracy in their students—skills essential to IT. In this age and in the developed world, the essential aspects of literacy and numeracy should include acquiring basic competency in document and spreadsheet manipulation.

Vocational education should also aim to impart skills in the literate and numerate use of computation within every trade. Schools should avoid vocational training in IT skills per se. Rather, the aim should be to produce workers in specialist fields, such as computer security and programming, who can work with professionals in various fields, but particularly with computing professionals.

If we accept computing as a secondary profession, and if we view all professions and vocations as benefiting from skillful data use, people seeking *professional* jobs will see that having computers and being able to program them matters "jack squat" compared to being able to help other people use them and benefit from that use. With luck, employers and government will come to see this, too. ■

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