The Profession's Future Lies in Its Past

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Teaching students fresh from secondary school about professional computing induces feelings of unreality and helplessness. The feeling of unreality comes from their belief that the profession they wish to join mainly involves using computers, and that the industry they expect to be working in is about as old as they are, if that. The feeling of helplessness comes from the extreme difficulty in getting them to believe anything else.

Unfortunately, the people most influential in their lives—parents, school teachers, career advisers, tutors, authors, and so on—all support the students' belief that a bright future lies ahead for skilled computer users in a brand-new IT industry that will pay them well.

These beliefs lack historical perspective. Ignorance of the past makes the future seem merely an enlargement of the present. It will not be. Wavelength division multiplexing should see to that. Professionals must be eager to command the future, not content to surrender to it.

THE COMPUTING INDUSTRY

We can best understand the computing industry's nature in the context of its history. Most people believe, falsely, that the industry started with the personal computer's introduction a couple of decades ago. Part of the problem here stems from the widespread misuse of the words "computing" and "computer." Computation constitutes only a minor use of computers nowadays, although quite the opposite was true, 50 years ago, of the first stored-program computers. Today, the design of mass-produced processor chips specifically supports video gaming, the chips' largest market, and computers are often merely doors to the Net and its Web.

Civilization is based on data processing. Our profession can be viewed as the source of our civilization, which we thus hold in our professional custody.

Digital technology now looms large in the consumer industry, both in various devices and in the coupling of such devices over the Internet. Computation of some kind certainly lives deep within these digital boxes, but computation is far from being the industry's main focus.

THE DATA-PROCESSING INDUSTRY

Fifty years ago, when most people believe the stored-program computer revolution began, "revolutionary" computers were brought into machine rooms already populated by a variety of data-processing machinery used by a host of data-processing workers. The stored-program computer's role was to do faster and more cheaply work that people were already doing with other kinds of machinery.

When the early data-processing industry required more than addition and subtraction, it turned to hand-operated calculators or to calculators programmed by plug boards. In the world of commerce, the early stored-program computers simply replaced heavier and slower calculators and tabulators.

The computing industry has a long history whose length depends on what we consider the industry to be. Viewing the industry as based merely on stored-program computers supposes a discontinuity that never existed.

Even the personal computer had antecedents. The first popular computers *were* personal—in 1960, as a programmer of the IBM 650, the most popular computer of its time, I was allocated time slots and operated the machine myself, *personally*. Small, cheap computers of the time—like the LINC, IBM 610, Bendix G15, and Librascope LGP30—were often described as personal computers. A little later, in 1969, there was even a home computer, the Honeywell H316 (http://www.ddj.com/columns/history/2000/200006hc/do200006hc001.htm).

DATA PROCESSING'S HISTORY

Nowadays, when we embellish so much talk with IT—that pretentious version of the old initialism, DP—an optimist would hold that the industry seems aware that data processing is its primary concern and that our profession has thus been evolving continuously. The question is, for how long has it been evolving?

Much of the commercial machinery up to and beyond the 1950s processed data stored on punched cards. Scientific computation, when it became automated, often used data stored in punched paper tape.

Amateur historians usually trace punched cards back to Hermann Hollerith's machinery, developed for use in the US national census of 1896. Around the same time, punched paper tape found use in telegraphy and music. Even earlier, Charles Babbage intended to use punched cards to program his mechanical automatic computer, an idea echoed in IBM's popular Card Programmed Calculator of the late 1940s.

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Significantly, such techniques are digital in that they encode data binarily and conventionally, just as current computers and telecommunications do. The tradition lives on.

But the digital tradition goes back far more than a century. Some writings trace the use of punched cards to Joseph-Marie Jacquard (1752-1834), whose automatic drawloom greatly speeded the textile industry's evolution. But Jacquard based his loom on the work of Jacques de Vaucanson, who in turn based his work on Robert Falcon's efforts. Falcon substituted cardboard for the earlier paper tape of Basile Bouchon. Bouchon's ideas probably derived from the annotated paper strips that drawboys used as an *aide memoire* when drawing the cords for the kind of drawloom used by Claude Dangon in the late 1500s (John Becker, *Pattern and Loom*, or http://www.cnam.fr/museum/revue/ref/202a07_a.html).

Nor was the binary tradition limited to holes in paper or card. Before the advent of player pianos, music boxes and a great variety of automatic devices ran on similar digital principles. Clockmakers often crafted these devices, the escapement clock itself being a digital device that evolved roughly a millennium ago. Computing professionals should find this clock's development especially significant. First, clocks create the discrete phenomena on which we base digital computers. No clock, no digital computer. Second, if we are to believe David Landes (*Revolution in Time*, 2nd ed., Harvard University Press, Boston, 2001), the development of clocks made possible the mercantile and industrial development of Western Europe, which so recently culminated in the dot-com bubble.

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QUALITATIVE DATA

The computational tag borne by our industry and profession is flawed because computers and the Internet process mostly qualitative data, which consists of text or other graphics rather than numbers. Printing out results has always been an important aspect of data processing, particularly in commerce and government. Indeed, the best-selling computer of the early 1960s, the IBM 1401, became popular despite its very basic computational ability because it combined the functions of a tabulating printer with those of a calculator.

Modern online printers have evolved through a variety of what might properly be called personal printers, back through the Teletype and many different typewriters. Mainframe printers have had a much richer history, back through rotary presses and the many different flatbed presses that depended on the use of movable type, a digital development distinct from that of the clock.

In the printing industry of the Western world, evolution from block printing to the use of movable type depended on developments in metallurgy and papermaking, and for a long time existed alongside and competed with the scribal industry.

The technology of written, and even spoken, language constitutes a form of digital data processing, given that we define data as "a representation of facts or ideas according to certain conventions." Taking this broad view, the data-processing industry, and our global civilization with it, has evolved through three phases:

- ephemeral data in the form of spoken language,
- static data in the form of written and printed language, and
- dynamic data in the form of binary encoding and signaling.

PROFESSIONS AND TRADES

In the very broad context of its history, what can we learn about the professional worker's role in the data-processing industry?

First, useful technology sooner or later escapes from the control of the privileged few and comes into widespread use. This diffusion is happening with modern digital technology now; has already occurred with calculators, typewriters, books, and handwriting; and can be inferred to have happened with spoken language.

Second, a mature industry consists of both trades and professions, with trade workers outnumbering professionals. In the printing industry, the compositors and press operators, who actually make the books, outnumber the typographers and designers, who tailor the books to

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the reader. The trades and crafts focus on the product, while the professionals focus on the product's *use*.

These days, the computing industry's product consists of its software and the hardware that runs it. Utterly codependent, the two were never fundamentally distinct: Whatever can be done with software can be done by hardware, and usually better.

The controlling bodies of the computing profession would be well advised to assist in the development of computing trades and crafts.

The computing industry's future depends on satisfying its products' users. Those products continue to become increasingly complex. The main producers in the industry cope with this difficulty, for the moment, by offering training in various special skills—such as network management—needed to operate their current product. Their trainees are not professionals, but trade workers.

Most people that the computing industry employs to produce its hardware and software focus on the product itself. They supervise automated manufacturing processes and code programs. They may need to be highly skilled, but they work in a trade or craft.

Most people that the computing industry's customers employ to use hardware and software work primarily in trades and in professions outside the computing industry itself. Their skills with computing machinery are, or should be, secondary to their own industry's skills.

Many of my students seem to want the glamour and unthreatening stimulation of working with computers for a living, along with the prestige and rewards of being a professional. And this is what they are being offered at present.

The computing industry has little need for true professionals because they can sell whatever they make. Marketing creates the demand they require. So industry is content, for the time being, to hire graduates versed in object-oriented computing.

Computing educators happily produce such graduates. Professional bodies create object-oriented curricula, which are delightfully straightforward for academics to teach. While the computing industry continues to grow, computing graduates will continue finding elite employment.

But history tells us that digital technology will loosen itself from the control of elites. Already, areas of professional education other than computing offer training in computer and Internet use. Already, computing industry producers offer public formal training in their products' use. Already, young adults who have used computers all their lives, at home and in school, find better jobs because of their computer skills.

Sooner or later—preferably sooner—public technical education authorities will provide intensive training in computing skills within a variety of specialties. The trade and craft workers thus created will compete well with the universities' pseudoprofessional computing graduates, and, going by experience in other trades, the good workers will be well rewarded and well respected.

The would-be controlling bodies of the computing profession would thus be well advised to assist in the development of computing trades and crafts. Further, they should broaden the definition of our profession to encompass a people-oriented focus, developed from the full context and importance of its history. ✷

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