Content and Pedagogy in Teaching About the Social Aspects of Computerization

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Abstract

This paper argues that university-level courses which examine the social aspects of computerization ought to be routinely available for students who plan to work as information or computing professionals. I discuss how students, especially those in information and computer science programs, can learn about the ethical issues and practical socio-technical design issues as they arise in their likely future work. There are many open choices for the content and pedagogy of such courses. I argue for a certain content - emphasize Organizational Informatics - as one central topic about the social aspects of computerization that is important for a growing fraction - arguably a majority - of information and computing professionals. My argument about the content of a first social analysis course is just one answer to the question of "what is most important for information and computer science students to learn about the social aspects of technology, and why?" I also discuss critical pedagogical approaches that help students engage the likely world of computerization as reflective practitioners. Similarly, the pedagogies that I suggest are one set of strategic choices; but they raise key questions about how technically oriented students can effectively learn complex social analytical approaches, or be motivated and skilled to learn to learn them, in one or two courses.

Keywords: Teaching, social issues in computing, organizational informatics, information and computer science education

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1.0 INTRODUCTION

Computing technologies have been dramatically transformed in 50 years. More seriously, the landscape of the computing world has also been transformed. But the range of topics that are routinely taught to students who study the information and computer sciences has changed much more slowly. The ways that computer systems can support human and group communications has become a central social phenomenon, one that overshadows the traditional importance of high speed computation and data management. Today, more powerful computers attract much less attention than the expansion of computer-communication networks, like the Internet, that carry more and more stuff - data, gossip, news, opinions, analyses, and propaganda - to tens of millions of people worldwide. Computerization has shifted from a process that interested only a few specialists to a topic that is discussed broadly in academia and the mass media.

Some university departments have offered serious analytical courses about social aspects of computerization since the late 1960s. The topic is an elective in many North American information and computer science departments, but required in few. The organizational dimensions of computerization are taught routinely as information systems (IS) courses in many business schools and a few schools of library and information science. Increasingly, faculty in diverse social scientific and humanisti c disciplines are teaching courses about Cyberspace, electronic writing, and similar topics.

I am differentiating serious analytical courses about social aspects of computerization from the much more numerous courses in information technologies (including introductory computing and Internet courses), computational methods, and "information literacy" that devote a week or two examining some specific social aspects of computerization.

The courses that offer students a sustained serious analysis of computerization have been contested terrain in many universities. In computer science departments, some of the faculty stigmatize them as "soft courses." In the North American business schools that have been taken over by economists, behaviourally oriented IS courses have been subject to their more general attacks on courses and research about human behavior. In the social sciences, technology is not a

central theme of the disciplines and national curricula; so such courses are treated as elective and are taught where faculty have strong specialized interests in information technology and social life.

This is a period of "sea-change" in which the number and diversity of university-level courses that examine the social aspects of computerization is rising. I believe that such courses ought be routinely available for students who plan to work as information or computing professionals. And I will focus on their education in this paper. However, I also hope to identify key issues about the pedagogy and content of such courses that stimulate thinking about curricula for students at other levels of education, and with other occupational and life interests.

2. WHAT DO WE WANT STUDENTS TO LEARN?

Each of us wh o organize courses or curricula faces pressing questions of what we want students to learn and what to teach. There are generally two distinct emphases in courses about social aspects of computerization: courses that emphasize ethical and those that emp hasize social analysis. A recent report by Chuck Huff and Dianne Martin (1995) about teaching social aspects of computing to information and computer science students argues that both foci are equally important; but they don't address concrete instructional design issues about how to enable technically oriented students to effectively learn both ethical analysis and social analysis in a typical one term course. In practice, instructors tend to emphasize either social or ethical analyses. One key question is how to decide which kinds of ideas to emphasize in a limited timeframe. I will indicate my own lines of reasoning; but I encourage readers to identify their own basic arguments.

Some courses about the social aspects of computerization focus on ethical issues of computing, with a logic that is akin to that used to argue that physicists should be aware of the ethical issues in nuclear weapons design. A course with an ethical emphasis takes a kind of high road by encouraging scientists and technical specialists to think of themselves as influencing major technological choices and the possible fates of thousands, millions, or even billions of people. Such courses can be expansive in social scale and historical scale -encouraging scientists and technical specialists to "think big."

My own rationale for enabling information and computer students to learn about the social aspects of computerization is much more mundane. It is based on a belief that information and computing profess ionals must be proficient in analyzing the social and technical choices for computerization projects in order to carry out in their routine work. Despite a growing consumer marketplace for PCs and online services, organizations are still the primary adopters of computerized systems. These organizationally situated computer systems are used to provide services to the public (i.e., travel reservations), professional services, or to structure work and data inside the organization. Information and computing professionals need to consider the social aspects of systems if their projects are to adequately improve the quality of an organization's working conditions or computer- mediated services.

Over the last decades, the kinds of technical system s and situations that information and computing professionals face has changed rapidly. A growing fraction of these professionals

now work socially closer to the people who use computer applications, and are in positions to influence social and technical work practices that can improve (or undermine) the quality of people's work and the performance of their organizations.

A ordinary example is easy to provide. As I was writing this section I received a phone call from a reporter for a local n ewspaper. She was writing a story about the virtue and vice of a company's using software that would allegedly remove computer games from their workers' PCs (Williams, 1996). It is easy to take a mechanistic and legalistic approach to the use of such game-removing programs. One can say that PCs are an organizations property, that employees are not paid to play games, and game removers will increase organizational productivity. Or one can view an organizations sleuthing a workers' PC as a violation of workplace privacy, akin to rifling through one's desk in search of playing cards, chess games, and crossword puzzles. I believe that a more thorough analysis would examine a complex set of issues about manager-worker relations, focus on commitment-building or controlling as a preferred managerial style, employee prerogatives in using organizational resources for personal purposes, and the ways that an organization deals with employees working unpaid overtimes and taking work home. This example also raises cultural questions about whether organizations should be acquiring PCs ("personal computers") or something else, such as workstations or ICs ("impersonal computers") for the staffs. Superficially, the "games eliminator" is a kind of technical fix w hose actual use is snared in a complex web of social practices, workplace relations and other social choices. This example offers a commonplace, but intriguing set of ehical and social situations when compared with, say, global thermonuclear war. I don't want to trivialize the value of social analysis by emphasizing computer games at work. In a subsequent section, I will give some "higher stakes' examples.

It is worth reviewing some of the changes in the character of information technologies in the last 30 years, and the new conditions of professional computing work. The technological and social landscape of the information and computer sciences are changing rapidly. Between the 1950s and early 1970s, most computerized systems were run on l arge, costly and centralized mainframe computers. Most computer scientists (including diverse technical professionals who developed and managed computer systems) worked in specialist organizations that were socially quite distant from the various groups that used their "heavy iron." The applications were computationally intensive and usually centralized on one computer - whether they were scientific calculations or transaction processing for organizations. Even in this era, "systems analysts" designed key aspects of computer applications for use in organizations that should have taken account of the working conditions of diverse people who use their systems.

In the subsequent phases of computerization, with an emphasis upon minicomputers in the mid-1970s and upon PCs since the mid-1980s, an increasing fraction of information and computer professionals were employed socially closer to the workplaces of men and women who used computer applications. In addition, the growing popularity of PCs with easier to use interfaces (not "always easy," but often easier) gave many professionals a personal experience in which the dream of having computing applications gracefully support their work seemed realizable in a near future. The current phase of computerization is characterized by forms of computing that support individual and group communication; inside organizations, between them, and for the larger public. A major form of information infrastructure, the Internet can serve as a symbol for

this phase. But the range of applications are not limited to those that run on the Internet (i.e., diverse proprietary e-mail systems, computer conferencing, Lotus Notes).

The employment patterns of information and computer professionals have become more diverse in each phase. The software products industry grew as a site of employment in the 1970s, was fueled by the spread of tens of millions of microcomputers, and does not show immediate signs of stabilizing (at least in North America). Mainframes and centralized computing services are still common in large organizations and as key nodes of national networking infrastructure, even though they constitute a smaller fraction of the technologies and sites through which people make visible contact with computer systems. But a large and growing fraction of information and computing professionals are in positions to influence social and technical work practices that can improve (or undermine) the quality of people's work and the performance of their or ganizations.

3. INFORMATION AND COMPUTER SCIENTISTS AS MORAL PHILOSOPHERS AND SOCIAL ANALYSTS

Information and computer specialists, as well as management consultants often propose computerized systems which they argue, will help people and organizations in new ways. Thus, a critical investigation into the organizational and social value of new technological systems requires social- analytical skills that lie beyond software and algorithm design. Howard Rheingold (1996) raises this issue rather poignantly with regard to designing WWW capabilities that support the development of communities on-line:

So far, the Web has lacked some of the most important tools people need to build virtual communities. Web publishers are responding to this lack by creating new tools, but as one of the first people to design a Web-based conferencing system, I can say that the most important thing designers of future systems can do is to become very familiar with the dynamics of group conversation in the pre-multimedia age. You can know all there is to know about graphics compression and other technical matters, but if you don't know why people spend hours a day, years at a time, participating in the same ongoing exchange of silent, visually uninteresting, typed messages, it doesn't matter how slick you make it look. If you don't know why people grew so enchanted with many-to-many communication back in the text-only days, you won't know how to build the foundation of a virtual community.

Some of my colleagues have been finding it difficult to develop effective electronic discussion lists that would support debates about articles that are published in electronic journals, such as the *Journal of Artificial Intelligence Research* (URL gopher://p.gp.cs.cmu.edu/) and *PostModern Culture*. Their dilemmas ar not simply technological; they can build technologicaly adequate on-line d iscussion facilities and then find that their readers don't use them.

There is, of course, a moral dimension to the design of any computerized system or service (Huff and Martin, 1995; Kling, 1996b; Kling, 1996g). In its simplest form, there are ethical questions about the extent to which people should increase their dependency upon computerized services and systems, the amount of time that people should spend on-line, and whether some groups are unfairly and systematically disadvantaged by a shift to computerized services. Paul Goodman, an

American social analyst, argued that technologists, including computer specialists, were primarily social activists who acted, in practice, as moral philosophers:

Whether or not it draws on new scientific research, technology is a branch of moral philosophy, not of science. It aims at prudent goods for the commonweal and to provide efficient means for those goods . . . . As a moral philosopher, a technician should be able to criticize the programs given to him to implement. As a professional in a community of learned professionals, a technologist must have a different kind of training . . . . He should know something of the social sciences, law, the fine arts, and medicine, as well as relevant natural sciences (Goodman, 1969).

In the traditional view, technologists are often asked to refine the means that they use to implement a product, but not to question the ends they serve. Ian Reinecke goes even further in that direction, suggesting that technical communities are impervious to serious critical analyses:

Those who know most about technology are in many cases the worst equipped to appreciate its implications for the lives of ordinary people. Consumed by technical and corporate objectives that become ends in themselves, they fail to see that their work may very often be contrary to the interests of their fellow citizens. So frenetic is the pace of change that the few querulous voices raised from their own ranks are swept aside. Where the voices are more insistent, they are branded as renegades, as unstable people whose work has somehow unhinged them (Reinecke, 1984, p. 243).

I do not share Reinecke's wholesale condemnation of technical professionals, although there is little evidence that the CS community has been a comfortable place for people who raise deep questions about various forms of computerization. The ACM's Special Interest Group on Computers and Society (SIGCAS) and IFIP's Technical Committee on Computers and Society (TC-9) have developed publications, conferences, and other forums for examining social issues of computerization. But these are rather marginal oases in the computing world; and their participants receive relatively scant support from their home organizations (such as universities and industrial firms).

Some computer science journals, such as *Communications of the ACM*, publish articles that systematically examine the social aspects of computerization. But most of the analytical literature about social aspects of computerization appears in IS journals, specialty journals such as *The Information Society*, and scattered through the journals of diverse disciplines such as communications, sociology, and management.

Reinecke's criticism is most apt for technologists who remain somewhat self-consciously indifferent to the social complexities of computerization, except to acknowledge the importance of their own special interests. Further, relatively few of the practicing technologists in top industrial and service firms read broadly about the social aspects of computerization. Sadly, a substantial fraction of computer specialists focus their professional reading on a narrowly drawn technical literature. A course about the social aspects of computerization is one way to give students access to important analytical concepts about designing and developing systems in a social world.

4. THE CENTRALITY OF ORGANIZATIONS IN THE COMPUTERIZATION OF SOCIETY

Organizations play powerful roles in the computerization of industrialized societies - as developers and vendors of computer equipment, as providers of computer-mediated services (such as airline reservations and banking, and as adopters of computer systems for their own internal practices. Consequently, it's important that we understand how organizations behave. The owners and managers of organizations often take organizations for granted. But many technical professionals are ambivalent about the roles of organizations in understanding how our society computerizes (see Kling, 1996d).

Despite the ambivalence that many professionals feel about organizations, they are also central players in our national stories of computerization. Huge companies, like IBM, Burroughs, General Electric and RCA built the earliest computers in the 1950s. These costly room-sized behemoths were bought by large government agencies, such as the Department of Defense and the United States Census Bureau, as well as by large private firms such as the Bank of America.

Today, a book-sized four pound $1200 "sub-notebook PC" packs the computing power of million dollar mainframe computers of the 1960s. We might imagine that the downsizing and price-reductions of computing technology has moved large organizations from center-stage in our national story of computerization since now anyone who can afford to buy a car or color TV can afford a computer or two as well. The press is carrying more stories about the ways that diverse people use computers, especially computer networks such as the Internet. Some analysts argue that a computer at hand enables a tiny business made up of a few people to compete with the biggest firms Naisbitt (1994). There is certainly some truth to the observation that tiny organizations have developed interesting software, and that tiny firms can sell high quality business services by carefully subcontracting some of the activities.

But tiny firms do not remain small when they manufacture millions of items, or provide services (such as training and repair) to thousands of customers. Apple Computer Company may have been started by two guys hacking in a garage. But in the 1990s, it employed about 16,000 people at its peak (and before its recent declines, 10,000 employees). Apple's behavior in releasing new products, servicing old ones, and so on was based, in part, how large organizations behave.

I believe that organizations, large and small, still play major roles in the shape of computing in North America. On the production side, huge firms like Microsoft, Apple, Sun, Hewlett-Packard and IBM play major roles in selling computer software and hardware. While a gifted designer might conceive of the fundamental features of new kinds of software, it will become commonplace through sales to millions of computer users only with the followon work of a small army of product developers, marketers, salespeople, and accountants. Large firms like Microsoft, Novell, AT&T, Symantic, and Oracle, as well as the major computer companies, refine and market the software that runs on millions of computers, large and small. The communications infrastructure for wide area networking is provided by another set of huge organizations, including AT&T, the seven regional Bell operating companies in the United States, MCI, and others.

We live in societies in which many key goods and services are provided by organizations that employ hundreds and thousands of people; airlines, state university systems, pharmaceutical firms, insurers, phone companies, hotels, automobile manufacturers, and so on. Of course, many important life events do not take place in relationship to organizations, especially large ones. But from our births in hospitals to the recording of our deaths by government administrators, we deal continually with organizations. And the ways that these organizations computerize can influence the nature of their services, the costs of their goods, the ways that we interact with them, and their kinds of workplaces that they create for tens of millions of North Americans.

It is easy to rely upon conventional simplifications about organizations and fail to understand how they behave. It is easy to refer to all government agencies as bureaucracies and emphasize their rigidities and rule-boundedness, while missing their roles as political agents that serve some interest groups more than others. It is easy to characterize private firms as efficient agents of their boards of directors, while underestimating the bureaucratic features of the larger firms. Or we might be willing to see a behemoth industrial firm like IBM as an arthritic bureaucracy, but miss the bureaucratic elements of more popular firms like Apple Computer or Ben and Jerry's ice cream company. In *Images of Organization*, Gareth Morgan examines about 30 different metaphors for understanding how organizations behave, as machines, brains, or psychic prisons. It is an important book to help expand one's understanding of the many different ways to view organizations, since no single metaphor is adequate.

5. ORGANIZATIONAL ANALYSIS IN INFORMATION AND COMPUTER SCIENCES

5.1 Competence in the Social Analysis of Computing

In North America, Business Schools are the primary institutional home of IS research and teaching. But this location is a mixed blessing. It brings IS research closer to organizational studies. But the institutional imperatives of business schools lead IS researchers to emphasize the development and use of systems in a narrow range of organizations, generally businesses, and often service industry firms. It excludes IS in important social sectors such as health care, military operations, air-traffic control, libraries, publishing, home and other uses. Much of IS teaching and research tries to avoid messy issues which many information and computer professionals encounter: developing requirements for effective systems and mitigating the major risks to people and organizations who depend upon them. Even so, it is far easier for a student in a typical business school to learn some key ideas about the social aspects of computerization that it is for students who specialize in the information and computer sciences. However, the information and computer sciences are also shackled with significant intellectual limits in helping their students learn about the social aspects of computerization. In the remainder of this paper, I will focus on the education of students who study the information and computer sciences, since that is a special focus of this IFIP workshop.

The dominant mathematical theoretical paradigms in academic information and computer science do not help technical professionals com-prehend the social complexities of computerization, since they focus on computability, rather than usability and human

communication. There are whole subfields of computer science, such as artificial intelligence, computer- human interaction, social impacts studies, and parts of software where mathematics cannot impart all the necessary analysis. The social sciences provide a complementary theoretical base for studies of computing that examine or make assumptions about human behavior.

Today, few of the 40,000 people who obtain BS and MS degrees in CS each year in the U.S. have good opportunities for systematic study of the reliable knowledge about the best design strategies, common uses, effective implementation, and assessments of value of computing in a social world. Yet a substantial fraction of these students go on to work for organizations attempting to produce or maintain systems that improve organizational performance without a good conceptual basis for their work. Consequently, many of them develop systems that underperform in organizational terms even when they are technically refined. They also recommend ineffective implementation procedures and are sometimes even counterproductive.

Managers and technical professionals often develop computerization projects with relatively simple themes; to enhance the operational efficiency of some organizational practice, to provide a new service, or sometimes even just "to modernize" by using current technologies. Even when the social visions of practitioners are relatively skimpy, computerization projects havei mportant social dimensions. However, computerization in industrial countries has also been the subject of a large body of popular and professional writing about what computer systems are good for and the character of their problems that most professionals have been exposed to. This exposure often influences implicit assumptions about computerization.

In today's argot, computer networks can connect us all to "a vast world of information." All we have to do is login and look at the immense opportunities through our video screens. I call this a heads-in view of computerization because it emphasizes what we can see through our video windows. In contrast, I believe that diverse professionals and citizens need a "heads-up" view of computerization; one that examines the social choices whether and how to computerize an activity, and the relationships between computerized activity and other parts of our social worlds.

For example, It is easy for a national politician to say that "every school, library, and medical clinic in the country" will be connected to highspeed data networks. It is less easy to find funds for appropriate (and rapidly obsolescent) computer equipment, staff training, and support services when school and library budgets are already stressed and when existing services are often poor. It is harder still to imagine why schooling would change when classrooms are wired, if pedagogies and teachers don't also change in ways that inspire inquiry and debate rather than emphasizing rote learning and quiet compliance. Information and computing professionals should have the skills to understand the character and repercussions of national scale programs like these

5.2 Organizational Informatics

Organizational Informatics denotes a field that studies the development and use of computerized IS and communication systems in organizations. It includes studies of their conception, design, effective implementation within organizations, maintenance, use, organizational value,

conditions that foster risks of failures, and their effects for people and an organization's clients. Organizational Informatics research uses theories of organizations and work to understand the complex relationship between the design and use ofinformation technologies and human behavior in organizations (see Kling, 1993; Huff and Finholt, 1994; Cotterman and Senn, 1992).

Organizational Informatics is a new chapter in the continued broadening of information and computer science. Emerging fields, such as human- computer interaction, do not replace the traditional core of these fields. Computer systems still depend upon on algorithms, whose computational features challenges are well described by mathematical theories. But mathematical theories of machine computation do not (and could not) provide a sound basis for understanding why some interfaces are more effective for people under certain conditions than others, or why many "technically sound" computer systems are used or not used by particular organizations.

The emerging field of Organizational Informatics builds upon research conducted under rubrics like IS and Information Engineering. But it is more wide ranging than either of these fields are in practice.

6. ORGANIZATIONAL INFORMATICS RESEARCH

In the last 20 years a loosely organized community of dozens of researchers has produced a notable body of systematic scientific research in Organizational Informatics. These studies examine a variety of topics, including:

- how system designers translate people's preferences into requirements;
- the functioning of software development teams in practice;
- the conditions that foster and impede the implementation of computerized systems within organizations;
- the ways that computerized systems simplify or complicate coordination within and between organizations;
- how people and organizations use systems in practice;
- the roles of computerized systems in altering work, group communication, power relationships, and organizational practices.

Researchers have extensively studied some of these topics, such as computerization and changing work (see Kling and Dunlop, 1993 and Kling and Jewett, 1994 for systematic reviews). Researchers have also examine other topics, such software design and work practices with empirical methods (e.g., Suchman, 1994; Bentley, et. al., 1992; Fish, et. al., 1993).

Information and computing professionals need ways to can understand what is taken for granted, and also problematic, about the theory and practice of organizing and organizations including the advocacy of new information systems associated with buzzwords such as CAD, TQM, JIT, MRP, CIM, BPR, CSCW, WWW, and client-server. Beneath this alphabet soup of technologies and management strategies are complex understandings (and misunderstandings) of the roles of information technology in organizing work. Information and computing professionals need ways

of seeing technological strategies in more social refined ways than are constituted by various vendors and consultants that are most interested in selling new technology-centered schemes.

I will mention two of the key insights that this research offers for professionals trying to understand how designing computing systems for organizations is more than simply a matter of applying computer technologies in specific settings (Kling and Allen, 1996) .

1. *The behavior of human organizations affects the design and implementation of computer systems*. The values, interests, skills, and formal positions of groups and individuals within organizations affect how initial design problems are framed, the possible range of design choices, and the resources available to support different design and implementation activities.
2. *The effective use of computerized systems in organizations does not depend on technology alone; it is contingent on organizational practices and resources*. Many other aspects of organizations- including job design, reward and incentive schemes, political negotiation, and cultural understandings- combine with technology choices to affect how computing is used in practice.

   Some intriguing research shows us how organizations shape the use of new technologies. For example, many of the people who write about electronic forums expect that electronic links and nifty software will enable people who work in different locations to share their expertise, just like professors. MIT Professor Wanda Orlikowski's (1993) studied the use of Lotus Notes' file sharing and e-mail system in a major U.S. based consulting firm. Her study raises questions about the extent to which powerful new technologies can provoke professionals in organizations to change their ways of working.

   Orlikowski's rich case illustrates the complexities of deploying a new information technology in a large decentralized professional organization. Lotus Notes was acquired by the firm's Chief Information Officer who was highly enthusiastic about its possibilities for enabling offices worldwide to rapidly share their expertise. However, as Orlikowski points out, he overestimated how much the potential for innovations based on Notes would "become obvious" to anyone who used it, and the extent to which diverse professionals would actually invest their time in learning about Notes. While Notes seemed to offer the possibility for consultants in different offices to share their expertise, she found that few consultants were interested in learning Notes or in using it. The big problem was not some aspect of Notes' design that could be refined in a niftier version of the software. It stemmed from many of the consultants' beliefs that the company's reward system would punish them for spending alot of their time learning new software and sharing their expertise about ways to solve business problems!

   These studies (and others in research literature) suggest that the reward systems in organizations can play a major role in the ways people use (or ignore) new information technologies. Technological capabilities may be unused (or turned to different uses) when they are not congruent with local reward systems and cultures (Hodas, 1993). These reward systems and cultures are part of what we call "social context." Many good research studies show that social contexts play powerful roles in shaping the use of

information technologies (see reviews in Kling, 1980; Kling and Jewett,1994). As Huff and Martin (1995) note, one basic social analytical skill is to enable students to learn how to identify the relevant contextual features of computerization projects.

Another set of key themes pertains to serious questions about the reliability of computer systems, and the risks borne by people who depend upon computer systems for medical diagnoses, financial transactions and other activities (Leveson, 1995; Neumann, 1995; Kling, 1996f). Specific organizational practices can buffer people from technically unreliable systems or place people at risk even when technical performance improves. Consequently, organizational analysis plays a key role in helping information and computer professionals conceptualize and advocate "safe systems."

7. PUBLIC COMPUTING ISSUES BEYOND ORGANIZATIONAL BOUNDARIES

In the earliest phases of computerization, organizations developed systems for their internal use. Through the 1960s, only a small fraction of computer systems directly touched the lives of ordinary people. But as diverse service organizations, such as banks, insurance companies, credit bureaus, police agencies computerized their record systems and developed more elaborate on-line systems, many people in industrialized countries dealt directly with computer-mediated services. Many people found these services, such as more flexible travel reservations and ATM machines, made life a bit more convenient. But stories of unexpected computer foulups and occasional personal nightmares were also commonplace.

The computer industry's promotion of computers for home use led millions of U.S. citizens to acquire PCs with hopes of support work at home, entertainment, or children's education. As of 1993, about one third of U.S. households owned at least one PC (Civille, 1995). Today, with the rise of publicly oriented computer services and the Internet, organizations that sell on-line computer services, tens of millions of people are being encouraged to use computer systems intimately on a daily basis.

These diverse uses stimulate significant concerns that cannot be adequately addressed in organizational terms. Organizational Informatics does not offer terms in which to engage Reineke's (1984) criticism of technical specialists:

> Those who know most about technology are in many cases the worst equipped to appreciate its implications for the lives of ordinary people. Consumed by technical and corporate objectives that become ends in themselves, they fail to see that their work may very often be contrary to the interests of their fellow citizens.

Whether or not one agrees with Reineke, one has to be able to conceptualize corporate objectives and citizens' interests, and any relationships between them. And citizens' interests cannot be adequately conceptualized in corporate (or market) terms.

For example, in Anglo and Western European countries, questions of access to public data and privacy over personal data have been long standing concerns (Kling, 1996e). There is a long series of studies about personal privacy and recordkeeping systems that indicates how even the interests of organizations and their clients often diverge regarding the collection and sharing of personal data. Mark Ackerman, Jonathan Allen and I (1996) link the adoption and use of new computer technologies for personal record systems to a set of social practices we refer to as *information entrepreneurialism*. Information entrepreneurial explanations focus on the active attempts of coalitions within organizations to organize production in such a way as to take advantage of changes in society and information technology. Information entrepreneurial practices are made efficacious by some of the major social transformations in industrialized society over the past century: the increasing mobility of populations, the growth of nationwide organizations, and the increasing importance of indirect social relationships. Information entrepreneurial practices are also encouraged by the development of more cost-effective technologies for managing large-scale databases and making fast computations. Analysts organize, implement, and utilize information systems to improve marketing, production, and operations as an organization shifts its managerial style to be more information entrepreneurial. Information systems multiply, as cost accounting, production monitoring, and market survey practices become a key resource in advancing the organization's competitive edge. Only a small fraction of these information systems contain personally sensitive data. But across the United States, these can lead to hundreds, if not thousands, of new personal record systems created every year.

Information entrepreneurialism relies on a set of skills that people are likely to learn by participating in specific social worlds including academic programs (such as MBA degree programs) and professional associations. We examined some popular MBA texts about information systems, which were a significant group of introductory books about organizational informatics. We found that their discussions of privacy issues were relatively superficial. For example, one of the most popular texts devotes about four of its 776 pages to privacy issues. The text lists five core privacy principles from a very influential Federal U.S. report. But the authors do not examine how these principles can be applied to any specific case, including any of the dozens of cases which they use to illustrate many other practices of information management. And the text does not provide any cases which examine privacy issues directly. Of course, instructors might supplement this text with rich illustrative cases. But I suspect that the emphasis of this Organizational Informatics text (and similar ones that we examined) will be reflected in most courses that use it.

It is easy to argue that information and computer science students who cannot study systematic organizational analyses (Organizational Informatics), are being deprived of key professional competencies. However, Organizational Informatics sets too narrow a social boundary in its focus on organizations and the interests of its diverse members to completely meet the public responsibilities and challenges that face many information and computing professionals. There is no shortage of interesting analytical materials that examine the social relatonships between people and organizations pertinent to computer-

mediated services or information policy issues (see for example, Berleur, et. al., 1991; Huff and Finholt, 1994;; Kling, 1996a).

8. APPROPRIATE PEDAGOGIES

8.1 Consensual Knowledge or a Foundation for Lifelong Professional Learning?

It is not hard to locate books and articles that suggest the content of courses about the social aspects of computerization (see, for example, Berleur, et. al., 1991; Huff and Finholt, 1994; Huff and Martin, 1995; Kling, 1996a). But there are very few books that examine the pedagogies for such courses (see, Jewett and Kling, 1996). Students who want to learn about the social aspects of computerization face a daunting set of challenges:

- The base of knowledge, even for subareas like Organizational Informatics, social aspects of computer-mediated communication, computer system safety, and ethical analysis, is scattered across a diffuse research literature.
- The research literature is written for specialty researchers in the jargon of various disciplines. Most students have trouble locating and understanding key research studies (since they have not been trained to work with research literatures).
- The research literatures about the social aspects of computerization, like any research literature, is populated with studies of varying quality, and is saturated with controversies that often take several years (or longer) to resolve. The sophisticated consumer of a research literature has to understand the key debates and the relevance of new studies to them.
- The good analyses of the social aspects of computerization depend upon the social context, social opportunities, and technological options available to participants.
- In each specialty area, there are a few relatively robust ideas and approaches that are appropriate for many diverse situations (see for example, Leveson, 1995; Kling and Jewett, 1994).
- We are in an era of rapid technological change and changing social circumstances under which people use information technologies. Many students have trouble seeing the relevance of research studies and case examples that are based on specific obsolete technologies. (This tends to make even the few terrific specialty books seem dated after a few years).
- The base of social-analytical knowledge that students can learn today is but a small fraction of what they may well need for effective professional practice in 10 years.
- Few students will have more than a 10-16 week term in which to learn an approach to understanding the social aspects of computerization to serve as a launching pad for their professional lives.

I will discuss one pedagogical approach that I believe helps students effectively learn complex social analytical approaches, or be motivated and skilled to learn to learn them, in a first course. I offer my approach as a serious model. But most seriously, I want to

open the question about what kinds of pedagogies will be most effective for helping students in different circumstances learn about the social aspects of computerization.

Faculty who organize courses about the social aspects of computerization face a few options. One approach is to teach in ways that are commonplace in the sciences; to find the best textbook and organize a series of related authoritative lectures. North American Information and Computer Science students mostly study from textbooks written specially for college students. Textbooks are an unusual kind of document, since they are often extremely well organized when compared with other kinds of books and articles. They also tend to avoid controversy and distill the consensus about a topic into a coherent exposition, complete with definitions of key terms, numerous examples organized in increasing complexity, and specific exercises. Textbooks have special value because they can make complex ideas accessible. Most undergraduate and beginning graduate information and computer science students take the majority of their courses in a lecture/textbook format and feel comfortable with it. But textbooks and lectures have significant limitations, because their authoritative format does not normally stimulate much critical thinking (see Leidner and Jarvenpaa, 1995). (There are some exceptional textbooks and a few faculty who might stimulate some ordinary students to think critically with dynamic lectures). Most seriously, the well organized and cognitively controlled world of the didactic text and lectures does not help students develop effective strategies for comprehending the ill-organized, confusing, and conflicting discourses about computerization in the world outside our classrooms.

I am not criticizing teaching via periodic lectures or the use of texts as *part* of an instructional approach for teaching about the social aspects of computerization. But I am arguing that students need more active and engaged forms of learning as well. This claim has significant repercussions for the staffing of courses, since the size of a lecture class is limited by the size of available rooms and the nature of audio-visual aides. In contrast, a mode of instruction that engages students in sustained critical thinking usually requires some periodic dialog with other students and instructors. These approaches are relatively labor intensive and do not scale up well.

I believe that the eight challenges that I listed above require us to identify a set of instructional goals that are quite different from those of courses, like abstract algebra, where there are a consensually well identified and stable set of concepts to communicate. I believe that we have to help students develop a professional literacy - a set of effective strategies for comprehending the ill-organized, confusing, and conflicting discourses about computerization in the world outside our classrooms.

Literacy is the ability to make full sense and productive use of the opportunities of written language in the culture in which one lives. For scientists and professionals, literacy includes the abilities to understand the nature and value of new approaches, and to evaluate key scientific and professional controversies. There are numerous technological controversies in the information and computer sciences, such as those about the choices of appropriate system designs, implementation strategies, programming languages, and ways of organizing large bodies of multi-media materials for effective use.

And there are key social controversies about the nature of effective and safe computing practices (including education, regulation, licensing). Most of these controversies are not resolved definitively in some distant city and then promulgated instantly throughout the planet. They are the subject of ongoing debates in a variety of scholarly and professional publications and also within the kinds of organizations students are likely to work for. And they may be temporarily resolved in a specific place by the kinds of choices that professionals help make on very specific projects.

A key goal of professional and scientific reading is being able to evaluate information and conflicting or incomplete claims analytically. Writings speak for their authors, and like other humans, authors can be prejudiced, ignorant of important facts or concepts or mendacious -- or wise, honest, knowledgeable, and reliable. A critical reader can carefully test readings for their logic, and seek to identify strengths and weaknesses. (Critical readers also learn more and enjoy their reading more than passive readers.)

I have found that technically-oriented undergraduates can become very capable of working with complex bodies of diverse texts once they realize that many of the conventions about the authority of a single-voiced text and passive reading are not appropriate. Because this approach relates more directly to the "real world" of future professional practice, many students also find it refreshing and exciting. But it does require disciplined work.

Other analysts see computerization in different terms than I do. Consequently, the authors of the materials that I use in my teaching develop some positions that I support, and others with which I strongly differ (see Kling, 1996a). Above all, I believe many scholars, professionals and students are not adequately aware of the debates about the *social* issues surrounding computerization. Professionals and managers of all kinds, including computer specialists, often take sides through their actions, without understanding the key assumptions and limitations of their positions. I have learned and seen other scholars, professionals, and students learn about computerization by truly engaging and deliberating different points of view. One of the important skills for any professional in a design discipline, whether it is architecture, urban planning, information systems, or computer science, is to learn how to see their artifacts from multiple points of view, and especially from the perspectives of the diverse men and women that may use them. Remarkably, the education of many information and computer scientists often organized around themes, such as "the right way," and "the optimal way" that minimize the relevance of other participants' points of view.

I require students to read and understand diverse and conflicting texts, rather than an authoritative textbook written in one voice. This approach requires some different skills than many information and computer science students have used in most of their other technical courses. One key difference is that students have to orient themselves to the framework of diverse writers who are not writing specially for them. I give students articles and book excerpts from diverse sources; from major U.S. newspapers, general scientific magazines, popular, professional and scholarly computer science journals, law journals, business magazines and social science journals (Kling, 1996). These different

publications aim at different audiences, encourage their authors to write with different concepts, and take some work (an professorial help) to get oriented to. These are the kinds of publications that publish important articles about the social aspects of computerization, and I would like students to learn how to read them critically.

Critical thinking is a disposition, a way of approaching issues and materials. It is a disposition of "reflective skepticism;" the judicious suspension of assent, readiness to consider alternative explanations, not taking key ideas for granted when it might be reasonable to doubt them. It is frequently a challenge to conventional ways of thinking and to passively accepting every text you read as comparably authoritative.

There are certainly other teaching strategies that engage students beyond simply giving them a body of diverse books or articles to read and analyze. Instructors can help students carry out projects, organize debates, and so on (see Jewett, 1996; Jewett and Kling, 1996). And these activities are, in my view, also essential strategies for engaged learning. My main point is not to emphasize a specific set of methods as much as to raise the question about how to improve our students abilities to understand the social aspects of computerization in a complex and rapidly changing world (see also, Boland and Tenkasi, 1995).

8.2 Reflective Practice

The computing world is very future oriented. In the computing world, the past is often regarded as a repository of dusty memories of obsolete clunky technologies. In this view, people's past experiences with computerization are primarily an opportunity for nostalgia or simply a point of reference against which the improved present and a magnificent future can be put in perspective. In the extreme forms of this, sometimes advanced by people who work at technological research frontiers, new technologies will transform our worlds so profoundly that there is no meaningful way to anticipate the key changes. The best that one can do is simply ride the wave of technological innovation and enjoy the trip.

But students can learn some key ideas about the social aspects of computerization from their own experiences and other people's experiences of computerization. Imel (1992) characterizes reflective practice as "a mode that integrates or links thought and action with reflection. It involves thinking about and critically analyzing one's actions with the goal of improving one's professional practice." Peters (1991:p. 95), characterizes "it is a special kind of practice... that involves a systematic inquiry into the practice itself." (Also see, Schon, 1983).

A simple example can illustrate reflective practice. In the last few years I have used electronic newsgroups to supplement in-class discussions by information and computer science students in a first course about the social issues in computing. Their own reactions to the use of electronic newsgroups provides an interesting opportunity for reflection on their own work practices.

I usually open this first course with an examination of technological utopian and technological anti-utopian genres of analysis (Kling, 1994; Kling, 1996c). *Technological utopianism* is a form of analyses that places the use of some specific technology; computers, nuclear energy, or low-energy low-impact technologies as the central enabling element of a utopian vision. Technological utopianism does not refer to a set of technolo- gies. It refers to analyses in which the use of specific technologies plays a key role in shaping a utopian social vision in which their use easily makes life enchanting and liberating for nearly everyone. In contrast, *technological anti-utopianism* examines how certain broad families of technology facilitate a social order that is relentlessly harsh, destructive, and miserable.

Many of the students are drawn by the romance of technological utopian narratives, and tend to readily dismiss critiques of computerization as biased, anti-progress, and so on. However, after I start requiring them to use the electronic discussion groups, some of the students complain about the work involved. Some of them have to visit a campus computing facility to read and post notes to the class's newsgroup. They would be willing to make time to visit and log in for "real computer work," such as programming; but this course requires them to spend time on much less legitimate activities - analytical reading and writing! In addition, even those who like the electronic newsgroup observe that they have to make special time to read and post; otherwise their possible contribution can seem dated after the discussion has moved on to a new subtopic.

My colleagues and I have faced some subtle socio-technical design issues in structuring the use of the newsgroups to effectively complement the class without being too burdensome on students. The students diverse reactions to the reading and writing to the newsgroups is a rich opportunity to discuss their experiences, and why they feel as they do (i.e., shy students feeling more opportunities for expression, other students feeling that the newsgroup is just another activity in a busy schedule). It is an opportunity to discuss the social and technical choices in making newsgroups work (i.e., discretionary versus required postings, support for managing discussion threads). The students learn a bit from each their about the ways that their immediate social contexts and technological arrangements influence their perceptions of technology in use. Those few students who are distressed by required postings have an occasion to note that there is unlikely to be some new discussion group technology that would transform their immediate angst into delight.

(Teaching effectively about socio-technical design is a related topic whose pedagogy merits significant exploration and discussion. It can be enhanced through design exercises and projects, as well as through examining rich case studies (Clement, 1994;Reese, 1995). But we know relatively little about the kinds of exercises, projects and analytical materials that work best for various kinds of students.) Tom Jewett has organized a web site that provides some materials and pointers for instructors who seek aditional help (see http://www.engr.csulb.edu/~jewett/social).

Some computer scientists like to emphasize life in a future society where everyone may carry a dozen "smart cards," and talk to computerized gadgets that open doors, cook

dinner, and carry out other routine work. Exciting (or demoralizing) as some of their visions may be, I believe that they often go askew insofar as they ignore important durable features of social life. These durable features, such as people's desire for human contact, or concerns about control in workplaces, are often very salient when we examine the use of computer technologies in both existing and emerging workplaces. Consequently, we can deepen our students abilities to become more reflective practitioners by devising some class activities that provoke disparate personal reactions and opportunities to examine them (see Jewett and Kling, 1996 for additional illustrations).

9. CONCLUSIONS

This is a period of "sea-change" in which the number and diversity of university-level courses that examine the social aspects of computerization is rising. I believe that such courses ought be routinely available for students who plan to work as information or computing professionals. I have focussed my paper on teaching courses for such students, based on my experiences in teaching such courses in the United States and Western Europe over the last 24 years. I suspect that some of the issues that I raise about the content and pedagogy o such courses will be of value to instructors who want to work with other groups -younger or older and those who will experience information technologies primarily as users rather than as technical professionals.

I have also taken some positions that may be relatively controversial. I have focussed on the value of helping students learn about the ethical issues and practical socio-technical design issues as they arise in their likely future work as information and computing professionals. This body of knowledge hardly exhausts the important topics; those pertinent to the role of computerization in diverse professions, those pertinent to the increasing computerization of commerce and social forums in North America and other industrialized regions, the growing importance of cyberculture, the national and international politics of computerization and so on. I have emphasized Organizational Informatics as one central, but also limited, study of the social aspects of computerization that is important for a growing fraction, arguably a majority of information and computing professionals. My argument about the content of a first social analysis course is just one answer to the question of "what is most important for information and computer science students to learn about the social aspects of technology, and why?"

I have also recommended pedagogical approaches that are relatively demanding of students and faculty efforts. These pedagogies help students engage the likely world of computerization as reflective practitioners. At best, they energize and motivate both students and faculty to see the possibilities and problematics of computerization in fresh ways. The pedagogies that I suggest are only one set of strategic choices. But "pedagogy as a question" raises key questions about how technically oriented students can effectively learn complex social analytical approaches, or be motivated and skilled to learn to learn them, in one or two courses.

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