Reading "All About" Computerization: How Genre Conventions Shape Non-Fiction Social Analysis

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ABSTRACT

This paper examines unstated, but critical, social assumptions which underlie social analyses of computerization. It focuses on the popular, professional and scholarly literature which claims to describe the actual nature of computerization, the character of computer use, and the social choices and changes that result from computerization. Many articles and books in this large and diverse literature are written within the conventions of specific genres. These conventions of each of these genres limit the kinds of ideas which authors can explore and communicate effectively. This paper examines five common and important genres: technological utopian, technological anti-utopian, social realism, social theory, and analytical reduction. Each genre is characterized and illustrated. The strengths and weaknesses of each genre are described. A major theme of this paper is the way that any genre's conventions limits the kinds of ideas which authors can examine and communicate.

In the 1990s, there will be a large market for social analyses of computerization. Technological utopian analyses are most likely to dominate the popular and professional discourse. The empirically oriented accounts of social realism, social theory and analytical reduction, are likely to be much less common and also less commonly seen and read by computer professionals and policymakers. These genres are relatively subtle, portray a more ambiguous world, and have less rhetorical power to capture readers' imaginations. Even though they are more scientific, these empirically anchored genres don't seem to appeal to many scientists and engineers. It is ironic that computing -- often portrayed as an instrument of knowledge -- is primarily the subject of a popular and professional literature that are

heavily weighted towards the genres whose knowledge claims are least reliable. Conversely, the more reliable genres often have much less appeal in the computer science and engineering communities.

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DISCOURSES ABOUT COMPUTERIZATION

This paper examines how unstated, but critical, assumptions which underlie social analyses of computerization frame our understanding. I will focus on the popular, professional and scholarly literature in which authors claim to describe the actual nature of computerization, the character of computer use, and the social choices and changes that result from computerization. I am not including certain kinds of writing which are also very important, but which do not claim to literally characterize the empirical world, now or in the future: ethical studies, normative policy analyses, analyses of discourse (such as this article), and works which are self-consciously fictional (including science fiction).

Every year thousands of articles and dozens of books comment on the meaning of new computer technologies for people, organizations, and the larger society. Since computer technologies are likely to improve significantly over the next few decades, we should expect periodic accounts of the social meanings of new technologies. Moreover, as we approach the year 2000, there will be a predictable flood of books and articles that examine the virtues and problems of computer technology in the 21st century.

A large fraction of the literature about computing describes emerging technologies and the ways they can expand the limits of the possible. Faster, tinier computers can make it easier for people to access information in a wider variety of places. Larger memories can make more data accessible. Richer display devices can help people communicate more readily with computerized systems through pictures and text. High speed networks, such as Usenet and Internet, link thousands of computer systems together in ways only dreamed of in 1970. The remarkable improvement in the capabilities of equipment from one decade to the next generate breathless excitement by researchers, developers, and entrepreneurs, as well as by the battalions of journalists who document these events in the daily newspapers and weekly magazines.

Accounts of the powerful information processing capabilities of computer systems are usually central to many stories of computerization and social change. Authors write about these changes in technology and social life with different analytical and rhetorical strategies (Kling and Iacono, 1988; Kling and Iacono, 1991). Some authors enchant us with images of new technologies that offer exciting possibilities of manipulating large amounts of information rapidly with little effort -- to enhance control, to create insights, to search for information, and to facilitate cooperative work between people. Much less frequently, some

authors examine a darker social vision in that any likely form of computerization will amplify human misery -- people sacrificing their freedom to businesses and government agencies, people becoming very dependent on complex technologies that they don't comprehend, and sometimes the image of inadvertent global thermonuclear war. Both kinds of stories often reflect the conventions of utopian and anti-utopian writing. Authors craft utopian and anti- utopian writings within a set of conventions that limit what they can or will say. Even though these writings talk about social forms that the authors suggest are likely, their tacit conventions preclude their discussing important social relationships that are also likely. A genre refers to any body of work that is characterized by a set of conventions. The works that we readily identify as Romantic comedies, impressionist paintings, horror films, newspaper editorials, and popular movie reviews are often constructed with a set of conventions that make them readily intelligible and accessible. Authors and artists who work wholly within the conventions of a genre also limit the kinds of themes that they can effectively examine. Authors of romantic comedies usually have trouble exploring boredom in life and the ways that people work out sustained negotiations to get by day to day. Scholars have examined the ways that literary formulas shape fiction (Cawelti, 1976), journalistic conventions shape newsmaking (Tuchman, 1978; Campbell, 1991), and academic conventions shape scholarship (McCloskey, 1990; Van Maanen, 1988).

This paper carries these conceptions of genre formulas as epistemological envelopes further into the realm of writing which is putatively non-fictional, writing which authors position as telling us truths about the world of computerization "out there" and beyond the author's imagination. A major theme of this paper is that many social analyses of computing are written with genre conventions that limit the kinds of ideas that can be readily examined. Conventions make works more easily intelligible. But I have found that scholars and professionals who read these social analyses are often unaware of the ways that works are crafted within the conventions of specific genres, and the ways in that these conventions limit as well as facilitate analysis and debate. A major contribution of this paper is to examine some key genres of writing about computerization and to examine their conventions.

The utopian and anti-utopian genres of social analysis are about 500 years old, and predate the social sciences by about 350 years. Authors who work within these genres examine certain kind of social possibilities, and usually move quite freely beyond the technologies one finds in use today and beyond social relationships that are commonplace today. Utopian tales are devised to stimulate hope in future possibilities, while anti-utopian tales are devised to stimulate anger at horrible possibilities. Technological utopianism is particularly influential in North America. Appreciating its epistemology helps understand an important aspect of North American thought.

A different kind of investigative strategy and genres of reporting one's insights are based on examining existing computerized systems as they are actually used in real social settings. These investigations and genres of writing that communicate them rest on the empiricist's faith that by examining the world as it is, we can learn something important of the worlds that might be. I will examine three major genres that rest on empirical observation: social realism, social theory, and analytical reduction. These are not the only genres of social

analysis of computing. One can find works written with other conventions, such as expert surveys and personal reminiscences. But some of these five genres are commonplace, and others are important for developing systematic analyses. I am concerned with the strengths and limits of inquiries conceived and reported within these five genres: the two utopian genres and the three empirical genres. I hope that the analysis of these genres sensitizes readers to the way that any genre of social analysis has important strengths and limitations. I will first examine utopian and anti-utopian analyses of computerization.

TECHNOLOGICAL UTOPIANISM AND ANTI-UTOPIANISM

Technological Utopianism

Utopian thinkers portray societies in which people live ideal lives. The first such description appeared in Plato's Republic written some 2500 years ago. But the name Utopia derives from Thomas More, who published a story of an ideal society named Utopia in 1516. In Utopia people lived harmoniously and free of privation. His fanciful name, which meant "no- where," has been picked up and applied to a whole tradition of writing and thinking about the forms of society that would make many people happiest. There have been hundreds of utopian blueprints. They differ substantially in their details: some have focused on material abundance as the key to human happiness while other have advanced visions of happiness based on austere and simple ways of life. Some utopians advocate private property as a central social institution, while many place a primacy on shared property.

The most obvious utopian sources are discourses which the authors identify as fictional accounts with traditional devices such as made up characters and fanciful dialogue. We are concerned with discourses about computerization which authors present as primarily realistic or factual accounts (and which are cataloged as non-fiction in bookstores and libraries). We will show how some these discourses are shaped by the conventions of utopianism and anti-utopianism.

Edward Feigenbaum and Pamela McCorduck explicitly identify with utopian ideals when they close their book about the social virtues of expert systems with this observation:

> ... "utopian" also means something we have said many times and in many ways that we desire as a human good.... all this ... corresponds to Adam Smith's vision in The Wealth of Nations of a universal opulent society, a condition of plenty that frees the people from dependence and subordination to exercise true independence of spirit in autonomous actions (Feigenbaum and McCorduck, 1984:292).

The British author Tom Stonier (1983) also illustrates the utopian tradition in writing about information technology. He ends his book about the way that information technologies can transform societies with this observation:

> To sum up, everyone an aristocrat, everyone a philosopher. A massively expanded education system to provide not only training and information about how to make a living, but also on how to live. In late industrial society, we stopped worrying about food. In late communicative society, we will stop worrying about material resources. And just as the industrial economy

> eliminated slavery, famine, and pestilence, so will the post-industrial economy eliminate authoritarianism, war, and strife. For the first time in history, the rate at which we will solve problems will exceed the rate at which they will appear. This will leave us to get on with the real business of the next century. To take care of each other. To fathom what it means to be human. To explore intelligence. To move out into space (Stonier, 1983:214)."

Utopian images are common in many books and articles about computerization in society written by technologists and journalists. I am particularly interested in what can be learned, and how we can be misled, by a particular brand of utopian thought -- technological utopianism. This line of analysis places the use of some specific technology, such as computers, nuclear energy, or low-energy low-impact technologies, as key enabling elements of a utopian vision. Sometimes people will casually refer to exotic technologies -- like pocket computers which understand spoken language -- as "utopian gadgets." Technological utopianism does not refer to these technologies with amazing capabilities. It refers to analyses in which the use of specific technologies plays a key role in shaping a benign social vision. In contrast, technological anti- utopianism examines how certain broad families of technology are key enablers of a harsher and more destructive social order.

Utopian Elements in Technological Blueprints

Technologists who characterize new or future technologies often rest on utopian imagery when they examine their social meanings or implications. In 1948, before there were any working electronic computers, Vannevar Bush set forth a vision of a fast, flexible, remotely accessible desk-sized computer, called "memex" which would allow a researcher to electronically search through vast archives of articles, books, and notes electronically (Bush, 1988). He wrote:

> Wholly new forms of encyclopedia will appear, ready-made with a mesh of associative trails running through them, ready to be dropped into the memex, and there amplified. The lawyer has at his touch the associated opinions and decisions of his whole experience. The patent attorney has on call millions of issued patents, with familiar trails to every point of his client's interest. The physician, puzzled by a patient's reaction, strikes the trail established in studying an earlier similar case, and runs rapidly through analogous case histories, with side references to the classics for the pertinent anatomy and histology. The chemist, struggling with the synthesis of an organic compound, has all the chemical literature before him in his laboratory, with trails following the analogies of compounds, the side trails to their physical and chemical behavior.
>
> The historian, with a vast chronological account of people, parallels it with a skip trail which stops only at the salient items, and can follow at any time, contemporary trails which lead him all over civilization at a particular epoch. There is a new profession of trail blazers, those who find delight in the task of establishing useful trails through the enormous mass of the common record. The inheritance from the master becomes not only his additions to the world's record, but for his disciples, the entire scaffolding by which they were erected.

> Thus science may implement the ways in which man produces, stores, and consults the records of the race. (Bush, 1988:32).

Bush continued by describing the ways in which the users' ability to associate items, gather together the useful clusters of information that showed up during the search, and "instantly" project any or all of them onto displays for selective review, fast or slow.

> Presumably, man's spirit should be elevated if he can better review his shady past and analyze more completely and objectively his present problems. (Bush 1988:34).

Bush envisioned a flexible, compliant research assistant able to artfully fish through vast archives of textual information and gather the useful stuff embodied in an uncomplaining ever-ready machine. A seductive image indeed! This vision was ever more remarkable because the image of digital computers that dominated scientific writing at the time -- and even dominates scientific thinking in today's talk about supercomputers -- was high speed calculation of numerical data.

I could have examined any number of other technological visions -- of computer based instruction to transform education (Papert, 1980), or of information systems which would enable managers to more tightly control their business enterprises, etc. In part, these visions, like Bush's, rest on descriptions of computer-based devices and their information processing capabilities. In Fifth Generation , Edward Feigenbaum and Pamela McCorduck speculate about several possible applications of artificial intelligence to medicine, library searches, life at home, and help for the elderly. Feigenbaum and McCorduck speculate in terms similar to Bush -- by describing how these technologies might work under ideal conditions to help a person carry out socially useful actions. But they ignore key social conditions under which these technologies would be likely to be used.

A remarkably talented engineer, Douglas Engelbart, was inspired by Bush's vision. About 15 years later, he assembled a brilliant research team at the Stanford Research Institute to build computer systems which resembled Bush's Memex. At the time, computer technology had advanced to the point where room-sized computers could be "time-shared" by dozens of people and accessed through video displays in their offices. Engelbart described his project "to augment human intellect" in these terms:

> By 'augmenting human intellect' we mean increasing the capability of a man to approach a complex problem situation, gain comprehension to suit his particular needs, and to derive solutions to his problems.... we include the professional problems of diplomats, executives, social scientists, life scientists, physical scientists, attorneys, designers .... We refer to a way of life in an integrated domain where hunches, cut-and-try, intangibles, and the human 'feel for the situation' usefully coexist with powerful concepts, streamlined terminology and notation, sophisticated methods, and high powered electronic aids." (Engelbart, 1963).

Engelbart's team designed a novel system which included technologies which began to appear in the marketplace in the mid-1980s, such as the mouse, hypertext, and context-sensitive help available with function keys. Engelbart's team focussed on computer systems which would enhance the performance of groups of people working together. They

developed text systems which allowed different group members to have their own views of the same body of text. They built an electronic mail system which enabled people to track messages sent about various topics within their group. Today, there are some commercial "groupware" systems to facilitate the functioning of groups by allowing many people to work with common bodies of text, schedules, etc. Visions like Bush's and Engel- bart's, from which I have drawn tiny excerpts, serve as an inspiration for many technologists and affectionados of new technologies.

Visions like Bush's and Engelbart's are also flawed in the way they characterize technologies, people, and social life. They emphasize the ways that a technology should work ideally, under conditions where all the participants are highly cooperative to make things work their best. Some people call the field which researches and develops computer systems to support groups activities "computer supported cooperative work (CSCW)." In this label, the work of groups is implied to be cooperative by definition. Other kinds of social relationships in work groups -- such as those marked by conflict, competition, coercion, and even combat, are denied to exist by definition (Kling, 1991).

In an illustrative review of software, Frank Derfler Jr. (1989) argued that group scheduling or calendaring software was a critical module of "workgroup productivity software," although other modules, such as text processing and electronic mail, are important to make a more usable system. Derfler goes on to say:

> Scheduling three or more busy people for a meeting, along with arranging for a conference room and a slide projector, can be a frustrating and time-consuming task, requiring at least three phone calls. If one person or facility isn't available at the time the other people or facilities are, a whole series of negotiations begins. Mathematicians refer to it as progressive approximation; you (or your secretary making the arrangements) call it frustration. Before the scheduling problem is resolved, the number of people involved and phone calls made may have increased dramatically.
>
> Scheduling programs ... vary in how they confirm proposed events. The simpler packages assume that if the event fits on the calendar, that the people scheduled to attend will be there. Other programs ask for confirmation, while some go as far as to tie into electronic mail modules for notification.
>
> .... The best scheduling software is utterly useless if people aren't willing to play the game by keeping their personal calendars current. Obviously, these personal calendars are at the heart of the group scheduling process-- calendars that aren't readily available or easy to use will never be maintained by group participants. With this in mind, it seems imperative that these programs allow you to run the personal calendar module (interactively while running other programs) and make it easy to use (Derfler, 1989:248).

Derfler describes and critically evaluates key features of some major programs, and describes the best of these packages as dreams come true for busy professionals and managers. Like Vannevar Bush, Feigenbaum and McCorduck, he describes how these programs can facilitate various kids of group activities, such as scheduling, under the best of conditions: machines are up and running properly; people have immediate access to the

shared system to keep their calendars up-to-date; people actually keep their calendars up-to-date. Unfortunately, like many journalists, he does not explain what social conditions make these packages most effective -- or even usable at all. Derfler's article is titled "Imposing Efficiency," but he never describes why or how efficiency would be imposed by anyone involved with the systems he reviews. In discussing meeting scheduling, he observes, "The best scheduling software is utterly useless if people aren't willing to play the game by keeping their personal calendars current." However, he immediately moves from this central observation to a technical point: that the scheduling software should be designed so that it can "pop-up" whenever a person is running some other application. That way, if a person schedules a meeting by telephone when she is doing something else, like writing a memo, she can promptly update her electronic calendars with a minimum of interruption. That's a valid point. But Derfler never goes beyond the technical observation to examine the social practices of "imposed efficiencies," specifically the requirement that users accept and cooperate with the demands of managers who are trying to improve productivity through computerized systems.

Utopian Visions of Computerized Societies

So far, our examples focus on computer-based systems used by relatively small groups. But powerful images that link computerization and larger scale social change have entered ordinary language through newspapers, popular books, and advertisements. Terms like "computer revolution," "information society," "knowledge worker," "computer-mediated work," "intelligent machine". These catch phrases have strong metaphorical associations. They are often introduced by authors to advance positive exciting images of computerization. These new terms are often worked into common usage by journalists and authors who write for popular audiences. We live in a period of tremendous social changes. And sometimes new terms can help better capture emerging social patterns or new kinds of technologies, than can our conventional language. But the way that many authors casually use these terms often reflects important unexamined and often questionable social assumptions.

Alvin Toffler helped stimulate enthusiasm for computerization in these popular terms in his best seller The Third Wave. He characterized major social transformations in terms of large shifts in the organization of society -- driven by technological change. The "Second Wave" was the shift from agricultural societies to industrial societies. He contrasts industrial ways of organizing societies with new social trends that he links to computer and microelectronic technologies. Toffler is masterful in succinctly suggesting major social changes in succinct breathless prose. He also invented some of his own terminology to help characterize key social changes -- terms like second wave, third wave, electronic cottage, infosphere, technosphere, prosumer, intelligent environment, etc. Many of his new terms did not become commonly accepted. Even so, they help frame a seductive description of social change, as this excerpt from his chapter, "The Intelligent Environment" illustrates his approach:

> Today, as we construct a new info-sphere for a Third Wave civilization, we are imparting to the "dead" environment around us, not life, but intelligence. A key to this revolutionary advance is of course, the computer (Toffler, 1980:168)....

> As miniaturization advanced with lightening rapidity, as computer capacity soared and prices per function plunged, small cheap powerful minicomputers began to sprout everywhere. Every branch factory, laboratory, sales office, or engineering department claimed its own.... The brainpower of the computer ... was "distributed." This dispersion of computer intelligence is now moving ahead at high speed (Toffler, 1980:169).
>
> The dispersal of computers in the home, not to mention their interconnection in ramified networks, represents another advance in the construction of an intelligent environment. Yet even this is not all. The spread of machine intelligence reaches another level altogether with the arrival of microprocessors and microcomputers, those tiny chips of congealed intelligence that are about to become a part, it seems, of nearly all the things we make and use (Toffler, 1980:170)....
>
> What is inescapably clear, however, whatever we choose to believe, is that we are altering our infosphere fundamentally.... we are adding a whole new strata of communication to the social system. The emerging Third Wave infosphere makes that of the Second Wave era - dominated by its mass media, the post office, and the telephone - seem hopelessly primitive by contrast. (Toffler, 1980:172)....
>
> In all previous societies, the infosphere provided the means for communication between human beings. The Third Wave multiplies these means. But it also provides powerful facilities, for the first time in history, for machine-to-machine communication, and, even more astonishing, for conversation between humans and the intelligent environment around them. When we stand back and look at the larger picture, it becomes clear that the revolution in the infosphere is at least as dramatic as that of the technosphere -- in the energy system and the technological base of society. The work of constructing a new civilization is racing forward on many levels at once (Toffler, 1980:177-178)."

Toffler's breathless enthusiasm can be contagious -- but also stymies critical thought. Like Derfler, he assumes that key people -- e.g., administrators and purchasing agents -- will share his enthusiasm for the new technologies. Toffler also ignores cost constraints. Today, for example, many small colleges and universities are unable to provide adequate computer support for their faculty and students; community groups and poorer organizations also have trouble affording adequate computer systems.

Toffler illustrated changes in the infosphere with, The Source, a large commercial US-based computer-communication and messaging system which has thousands of individual and corporate subscribers (Toffler 1980:169). Today, he could multiply that example manifold with the emergence of competing commercial systems in the US, such as Compuserve, Prodigy and Genie, as well as tens of thousands of individually owned computerized bulletin boards that people have set up in hundreds of cities and towns. Similarly one could ask about the social roles of other messaging systems, such as Minitel

which supports numerous sexy messageries. However, there have been a myriad of other changes in the information environment in the United States which are not quite as exciting to people who would like to see a more thoughtful culture. For example, television has become a major source of information about world events for many children and adults. The popular television shows include soap operas, sitcoms, and rock video television networks like MTV. Television news, the most popular "factual" kind of television programming, slices stories into salami-thin 30-90 second segments and fits them to simple storylines. Moreover, there is some evidence that functional illiteracy is rising in the United States. The problems of literacy in the United States are probably not only a byproduct of television's popularity. But it is hard to take Toffler's optimistic account seriously when a large fraction of the population has trouble understanding key parts of the instruction manuals for automobiles and for commonplace home appliances, like refrigerators and televisions.

Toffler opens up important questions about the way that information technologies alter the ways that people perceive information, the kinds of information they can get easily, and how they handle the information they get. But his account -- like many popular accounts -- caricatures the answers by using only illustrations which support his generally buoyant theses. And he skillfully sidesteps tough questions while creating excitement (such as, "The work of constructing a new civilization is racing forward on many levels at once.").

Toffler's vision is not dated, however. Ten years later two respected information systems scholars examined offices of the late 1990s:

> "The office of the late 1990s can now be envisioned. Its staff of professionals and managers are surrounded by intelligent devices that speak, listen, or interact with them to determine what is to be accomplished and how it is to be done. Contacts with other departments, other divisions, customers, vendors, and other organizations are made with little effort and without human intervention. Behind the scenes, systems are being developed by system developers equipped with versatile and highly integrated software." (Straub and Wetherbe, 1989:1338)

This vision is similar to Toffler's, but less poetic. It portrays computerized information systems and offices similar to a spaceship in which the crew is highly automated and staffed with robots.

In a similarly upbeat manner, John Sculley, former Chairman of the Board of the Apple Computer Corporation, advocates the development of simulation, hypermedia and artificial intelligence to strengthen the United States economy and educational systems (Sculley, 1991). He argued by analogy with the role of print in the Renaissance. Sculley claims that print technology catalyzed the Renaissance which broke the stranglehold of the church and feudal interests on the population of Europe. He argues that computer systems based on hypermedia, simulation, and artificial intelligence applied to education are the appropriate means for a similar transformation today. Sculley's article is typical of some which try to excite a positive sense of purpose for developers and users of new computer technologies by referring to big historical changes such as the Renaissance or the Industrial Revolution. They excite hope for computerization by linking it to positive social ideals which they anchor in oversimplified and sometimes distorted historical accounts.

I have spent substantial space examining technological utopianism because it is a common genre for exploring the social meaning of new and future technologies in North America. And it is the genre which is most influential in the North American technological communities.

TECHNOLOGICAL ANTI-UTOPIANISM

There is a relatively small North American literature which critically examines key claims made about the social virtues of different computerization strategies. The technological anti-utopian critiques portray computerization --in almost any form the analyst can conceive -- as likely to degrade social life. (eg., Reinecke, 1984; Weizenbaum, 1976; Webster and Robins, 1986; Buesmans and Wieckert, 1989). I will illustrate this genre with two examples. Weizenbaum's Computer Power and Human Reason is a complex critique of computerized decision systems which their users and managers do not or cannot understand. He amplifies the underside of every computerized system which he discusses. For example, he criticizes visions of computerized databases which record historical data (like Vannevar Bush's Memex, which I described earlier), because they usually eliminate important information which is too complex or costly to include:

> .... The computer has thus begun to be an instrument for the destruction of history. For when society legitimates only those "data" that are in one standard format, then history, memory itself, is annihilated. The New York Times has already begun to build a "data bank" of current events. Of course, only those data that are easily derivable as by- products of typesetting machines are admissible to the system. As the number of subscribers to this system grows, as they learn to rely more and more upon "all the news that [was once] fit to print," as The Times proudly identifies its editorial policy, how long will it be before what counts as fact is determined by the system, before all other knowledge, all memory, is simply declared illegitimate? Soon a supersystem will be built, based on the New York Times' data bank (or one very much like it), from which "historians" will make inferences about what "really" happened, about who is connected to whom, and about the "real" logic of events (Weizenbaum, 1976:238) ....

Weizenbaum's observations gain more force when one realizes that journalists don't simply report "the facts." They often rely upon standard kinds of sources, voices of publicly legitimate authority, in framing stories. For example, when a university alters a curriculum, deans and professors are more likely to have a voice in the resulting news story than are students. Gaye Tuchman (1978) characterized reporters in search of a story as casting a selective "newsnet" around their favorite kinds of sources. Journalists rarely cast their nets to give equal voice to all kinds of informed parties. While reporters are much more likely to go to "the grass roots" today than they were in the days of Vannevar Bush, each newspaper prints a mix of stories in a style which reflects a relatively stable character. Usually, even if the mastheads were interchanged, one would not confuse the New York Times with a small town weekly newspaper. Without special design, nothing in the database technology would be likely to give a user a clue about its real limitations in representing a narrow range of perspectives. And, yet, its convenience might make it very tempting for a busy professional

to rely on it as a primary source, without appreciating its limitations. That is the cautionary note that one might draw from Weizenbaum's bitter observations. But Weizenbaum's argument is primarily polemical. He doesn't discuss any virtues of news databases or conditions under which they might not have the deleterious problems he identifies. News databases can also substantially assist in useful research as long as they do not become a sole source of information. Professional historians who have developed strong criteria for verifying events with original sources may be less likely to become their prisoners than many professionals (and students) who find them efficacious and seductive, despite their limitations. Moreover, Weizenbaum speaks with authority about future events ("soon a supersystem will be built...")

Discussions of computerization and work have been a major topic for both utopian and anti-utopian analysts (see Iacono and Kling, 1987). Some authors argue that computerization has systematically degraded clerical work through a pattern of industrialization (Braverman, 1974). Some go farther and argue that the computerization of clerical work sets the stage for the industrialization of professional work as well (Mowshowit z, 1986; Perrolle, 1991). Mowshowitz (1986) summarizes his sharp vision in these concise terms:

> Our principal point is that the lessons of the factory are the guiding principles of office automation. In large offices, clerical work has already been transformed into factory like production systems. The latest technology -- office automation -- is simply being used to consolidate and further a well established trend. For most clerical workers, this spells an intensification of factory discipline. For many professionals and managers, it signals a gradual loss of autonomy, task fragmentation and closer supervision -- courtesy of computerized monitoring. Communication and interaction will increasingly be mediated by computer. Work will become more abstract ... and opportunities for direct social interaction will diminish.

Like Weizenbaum, Mowshowitz writes authoritatively about distressing future events. He doesn't examine the possibility that many professionals will use their occupational power to resist the loss of autonomy and fragmented jobs that he describes. Nor does he examine how some professionals have exploited computerization to their advantage -- in making their jobs more interesting and complex. Elsewhere in his article, he criticizes studies which examine such variations as concerned with "minutiae." Mowshowitz follows Braverman's line of argument that (under capitalism), managers will computerize so as to enhance their control by degrading working conditions. Braverman's thesis has been subject to significant discussion and found wanting, because it doesn't account for other processes that shape computerization (such as enhancing control over expensive resources other than labor or improving product quality in the face of competition). Braverman's thesis is anti-utopian insofar as only one tragic outcome is likely. It is an important line of argument insofar as it locates computerization efforts within a logic of managerial interests, and highlights the importance of controlling labor as a key managerial interest.

Utopian and anti-utopian analysts share important common conventions. Their narratives are usually future oriented, universalize experiences with technologies, homogenize experiences into one or two groups, and portray technologies as totalizing elements which dominate important social interactions. They take extreme, but different, value positions.

They portray computerization with monochromatic brushes: white or black. The technological anti-utopians' characterizations of the tragic possibilities of computerization provide an essential counterbalance to the giddy-headed optimism of the technological utopian accounts. The romances and tragedies are not all identical. For example, some anti-utopian writings examine the possibilities of computerized systems for coercion, while others emphasize alienation. But the technological utopian and anti-utopian genres have some important inherent limitations which we now examine.

STRENGTHS and LIMITS of UTOPIAN ANALYSES

I have illustrated some utopian and anti-utopian analyses of computerization, and commented on some of their strengths and weaknesses in passing. To what extent are utopian or anti-utopian visions helpful in understanding the social possibilities of computerization? Despite key limitations which I shall characterize below, I see utopian and anti- utopian analyses as important and legitimate forms of speculative inquiry. Questions about the social consequences of new technologies are central to choices about paths for development, levels of social investment, and regulatory policies. These all merit analysis to help us better understand future possibilities. All such analyses rest on theories of the interplay between technological developments and social life. Utopian and anti-utopian themes are the most common in this culture. I will examine important alternatives to utopian and anti-utopian analyses in the next section -- social realism, social theory, and analytical reduction.

Utopian visions are sometimes characterized as "reality transcending" (Kumar, 1987; Kumar, 1991). They play important roles in stimulating hope and giving people a positive sense of direction. But they can mislead when their architects exaggerate the likelihood of easy and desirable social changes. Writing about technological utopianism in the 1930s, Wilson, Pilgrim and Tasjian (1986:335) comment:

> **Belief in the limitless future potential of the machine had both its positive and negative aspects. During the 1930s this almost blind faith in the power of the machine to make the world a better place helped hold a badly shattered nation together. ... These science fiction fantasies contributed to an almost naive approach to serious problems and a denial of problems that could already be foreseen.**

Anti-utopian writings are far less numerous in the United States. They serve as an important counterbalance to technological utopianism. But they could encourage a comparably ineffective sense of despair and inaction. Utopian and anti- utopian visions embody extreme assumptions about technology and human behavior. But their causal simplicity gives them great clarity and makes them easy to grasp -- to enjoy or to abhor. They can resonate with our dreams or nightmares. Consequently, they have immense influence in shaping the discussions (and real directions) of computerization. Their causal simplicity is their greatest strength, and also a point of entry to some crippling limitations which I examine now. (See Table #1 for a summary of the following analyses).

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Place Table #1 About Here
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Conflict

Technological utopian analysts portray a world which is free of substantial conflict. Technological anti-utopians usually portray certain fundamental conflicts such as between social classes (Mowshowitz, 1976 and 1986) or between government agencies and the public (Burnham, 1983) as almost unalterably unbalanced. One side virtually dominates while the other side mounts negligible resistance. Neither extreme characterizes the world in which social conflicts are important but in which coalitions draw complex lines and the intensity of conflict varies in place and time.

Practical attempts to establish utopian social schemes have been fraught with significant and complex conflicts. For example, the United States was founded premises that were utopian in the 1700s. The Declaration of Independence asserts that "all men were created equal" and that they would be should be guaranteed the right to "life, liberty, and the pursuit of happiness." This was in significant contrast to the political cultures of the European monarchies of the time, where the rule of the king or queen, and nobles, most of whom were selected by heredity, determined peoples' fates. Of course, asserting this right as universal didn't immediately make it so.

Utopian ideals are hard to realize. Their advocates often have to fight hard to change social practices to better fit their ideals. Bloody revolutions were fought in the United States and France to overthrow the ruling monarchies in the late 18th centuries. Almost 200 years later, Martin Luther King and others advanced the cause of improved civil rights in the United States through aggressive confrontations: marches, rallies, court injunctions and sit ins, as well as through more quite persuasion. These social changes which altered the balance of privilege and exploitation did not come quietly and peacefully. I have examined how Sculley underplays the level of conflict between the Catholic Church and other groups during the Renaissance and thereby transforms a bloody period into one in which a key technology (the printing press) became an agent of bloodless social change.

Distribution of Knowledge

In utopian analyses of computerization, people have whatever skills they need to adequately use systems and to resolve problems as they arise. Anti-utopian analyses vary in their accounts of technological skills. Sometimes everyone is adequately skilled, but are using technologies in ways that undermine important social values. In other anti-utopian accounts, many people are confused about key social relation- ships and the use of technologies. In these latter analyses, either elites control key skills or sometimes no one has key knowledge (as in Weizenbaum's account of "incomprehensible systems."). These accounts rarely portray people's technological skills as being distributed in complex ways: many people as having adequate technical skills for some of their activities, and muddling through on others

with help from co-workers or consultants, and being confused about a few technological activities.

Problems Caused by Technological Development

Technological utopians sometimes recognize that new technologies cause new problems -- but these are to be solved with additional technologies. Buckminster Fuller argued that it was difficult and almost pointless to teach people to drive very cautiously and to harass them with rigid laws. He argued for safer cars rather than for changing human behavior. Today's discussions that focus on computerized "smart cars" rather than smart drivers runs along a parallel line. Techno- logical utopians would usually advocate government funds invested in stimulating the development of new technologies rather than increasing the scale and scope of regulatory bureaucracies. As another kind of example, technological utopian discussions of computerization in schools emphasize the potentials of new technologies and ignore the ways that they may be unrealized when classes are overcrowded, teachers are not very sharp, and schools spend substantial efforts in trying to regiment students (Kling and Iacono, 1988). By focussing on new technologies as agents of social change and assuming that social systems will use them effectively, technological utopians ignore the social conditions for technologies to be effective. Consequently, they often overstate their social value. In contrast, technological anti- utopians often understate the social value of technological innovations and the way that all technologies pose problems.

Necessity of Technological Effects

Technological utopian and anti-utopian analysts suggest that the changes they foresee are virtually certain to happen if a technology is developed and disseminated. Their arguments gain rhetorical force through linear logics and the absence of important contingencies. This causal simplification is, in our view, a fatal flaw of utopian and anti-utopian speculations. They explore the character of possible social changes as if they were the only likely social changes.

BEYOND THE UTOPIAN IMPULSE:

SOCIAL REALISM, SOCIAL THEORY and ANALYTICAL REDUCTION

In the previous section, I identified four major characteristic limitations of technological utopian and anti-utopian analyses. Not all technological utopian (or anti-utopian analyses) are equally coherent, clear, or credible. But other forms of social analysis can also be incoherent or baseless. So clarity does not differentiate between utopian analyses and other modes of social analysis.

Attractive alternatives to utopian analysis should be more credible in characterizing conflict in a social order, the distribution of knowledge, the ways of solving problems that arise from new technologies, and resting upon less deterministic logics of social change. Most important, they would also identify the social contingencies which make technologies (un)workable and social changes benign or harmful for various social groups. I briefly identify three alternatives which are anchored in empiricism: social realism, social theory

and analytical reduction. Analyses in these three genres often acknowledge complex patterns of social conflict, yet are more open-ended and contingent than both genres of utopian analysis.

Social Realism

I use the label "social realism" to characterize a genre which uses empirical data to examine computerization as it is actually practiced and experienced. Social realists write their articles and books with a tacit label: "I have carefully observed and examined computerization in some key social settings that can change the way that you think about technology and social life. I will tell what I have seen." The most common methods are those of journalism (e.g., Salerno, 1991; Frantz, 1991) and the social sciences, such as critical inquiries (e.g., Forester 1989), and ethnography (e.g., Kling, 1978; Laudon, 1986;Dutton & Kraemer, 1986; Kling & Iacono; 1984). But the genre is best characterized by the efforts of authors to communicate their understanding of computerization as it "really works" based on reporting fine grained empirical detail (e.g., Stoll, 1991; Office of Technology Assessment, 1986). Social realism gains its force through gritty observations about the social worlds in which computer systems will be used.

An interesting example of social realism is found in a study of instructional computing in classrooms by Sheingold, Hawkins and Char (1984). They report on a number of ethnographic studies of instructional computing in specific classrooms, including the use of databases, a mathematical game, and LOGO programming. They carefully report different ways that teachers conceptualize the relationship between these programs and instruction (with resulting differences in ways that they integrate them into their classes). They also report a variety of ways that students use the programs, from those that fit conventional rationalist conceptions of media in learning to those that simply get the work done. In some instances the students wrote and ran their programs as they were instructed to. They worked together so that they all participated in solving problems and also in entering programs into their computers. But the cute title of the paper, "I'm the thinkist, you're the typist" comes from their observations of the educationally inappropriate way that two girls divided their efforts in programming with LOGO. This division of labor between a girl who took control of the problem solving and her partner who handled the mechanics of transcribing the LOGO program illustrates the ways that people will organize so as to rapidly complete their work done, but not necessarily satisfy broader (utopian) educational goals.

Another example of social realism is Grudin's (1989) analysis of the social assumptions that designers and advocates of groupware make about the use of these packages. He argues that the meeting scheduling systems championed by Derfler (1989) work best when their users all have secretaries to help keep their calendars up-to-date. These packages are especially attractive to managers, who often have secretaries, and who often want to schedule meetings with subordinates. They can be a burden to professionals who do not have secretarial support. They can also burden people who are away from their desks in meetings out of their offices part of the day, where they are making new commitments which are not reflected in their shared calendars. More deeply, Grudin examines computer applications with a model of organizations in which resources and authority are not equally distributed. Grudin places computer systems in work worlds in which there is a political economy of effort -- some

people can generate work for others. And the people who generate work may not have to work as hard as do the people who have to meet their requirements. Grudin's article examines the social contingencies which make these systems (un)workable. And Grudin takes some care in identifying which kinds of groupware are more troublesome.

Social realists vary in the extent to which they weave their evidence into tight narratives. Tighter stories can leave us more satisfied. But there is a risk that important elements that don't fit the narrative are ignored (cf. Campbell, 1991:22- 23). More frequently social realism offers us compelling frank portraits which suffer from particularism. Authors in this genre rarely are explicit in drawing concepts or themes which generalize across technologies and social settings from the rich literature about the social character of computerization, or in contrasting their study with many other studies or accounts in the computerization literature. Moreover, it is always debatable what the present can tell us about what the future can be like if social arrangements or technologies are substantially transformed.

Social Theory

In contrast with social realism, theoretical analysts explicitly develop or test concepts and theories that transcend specific situations. Unlike utopian and anti-utopian accounts, social theoretical works are not "reality transcending." But they are situation transcending. Some examples are reinforcement politics (Danziger, Dutton, Kling and Kraemer, 1982), web models (Kling and Scacchi, 1982; Kling, 1987; Kling, 1992), structuration theory (Orlikowski, 1991; Poole and DeSanctis, 1990), post-structuralist theories (Poster, 1991), Judith Perrolle's explication of social control theories (Perrolle, 1988), and Terry Winograd's (1988) explication of language-action theory.

Web models illustrate this kind of theoretical work. Walsham, Symons and Waema (1988) characterize web models in these terms:

> "The basic tenet of web models (Kling and Scacchi, 1982) is that a computer system is best conceptualized as an ensemble of equipment, applications and techniques with identifiable information processing capabilities. Each computing resource has costs and skill requirements which are only partially identifiable; in addition to its functional capabilities as an information processing tool it is a social object which may be highly charged with meaning. There is no specially separable 'human factor' for information systems: the development and routine operations of computer-based technologies hinge on many human judgment and actions, often influenced by political interests, structural constraints, and participants' definition of their situations.
>
> The network of producers and consumers around the focal computing resource is termed the 'production lattice'; the interdependencies in this network form the 'web' from which the model derives its name. The production lattice is a social organization which is itself embedded in a larger matrix of social and economic relations ('macrostructure') and is dependent upon a local infrastructure. According to web models, these macrostructures and local infra- structures direct the kind of computer-based service available at each node of the production lattice, and since they evolve over time computing developments

> are shaped by a set of historical commitments. In short, web models view information systems as 'complex social objects constrained by their context, infrastructure and history' (Kling and Scacchi, 1982)."

Web analyses are action-oriented and examine the political interplay of coalitions in structured -- but somewhat fluid -- settings (Kling, 1987). The main organizing concepts were a "focal computing technology" which was the center of analysis, the infrastructure which supported its development and operation (including production lattices), its context of development and use, and a history of organizational commitments which structured these arrangements. Researchers have applied web models to better understand a variety of cases, including dilemmas of developing the Worldwide Military Command and Control System, dilemmas of converting complex inventory control systems in manufacturing firms, the development of software in insurance firms, and the ways in which desktop computerization changes worklife in offices (Kling, in press).

Social theoretical studies of computerization offer the traditional virtues of theory: relatively concise general explanations and concepts which help guide inquiry in new situations. But they are much less accessible to a broad audience than technological utopian, anti-utopian and social realist accounts because of their intellectual demands: their (necessary) use of specialized terms and their frequent abstraction from the kinds of concrete situations that readers can readily visualize and perhaps identify with.

The contrast between social realism and social theory, as ideal types, is rather clear. And it is easy to find books and articles which illustrate these types. All social analyses are imbued with theoretical assumptions, however implicit (Kling, 1980). Journalists and others who are not trained in the social sciences are much more likely to write as social realists rather than as social theorists. Social scientists are more capable of developing theoretical inquiries, but they are more likely to publish social realist discourses about computerization or documents which apply existing theory to sharpen realist accounts. I believe that there is a shortage of good empirically anchored theoretical explorations of the social aspects of computerization.

Analytical Reduction

Some scholars organize their social investigations into computerization by working within a tightly defined conceptual framework. They identify a few key concepts, sometimes derived from theory or abstracted from a group of studies, and examine them in new settings. If they adopt a strictly quantitative social science approach, they operationalize all of their key concepts into variables, measure them, examine how behaviors are distributed along the variables and via mathematical relationships between variables (e.g., correlations). While completely quantitative studies represent ideal examples of this genre, studies which focus on a few qualitatively described dimensions share enough key characteristics to be appropriate to group with them also. Hiltz's (1988) paper on the ways that computer conferencing systems alter productivity of groups illustrates the quantitative version of the genre. Hiltz administered questionnaires to people who used four different computer conferencing system before and after a period of use. She grouped four survey questions items into a summary measure of productivity (e.g., quality of work with system, quantity of work with system, overall usefulness of system and utility of system in reaching other

people). She measured many aspects of the groups, their work, their usage of the conferencing systems, and the features of the systems. She bases her conclusions on the magnitude of quantitative relationships between the variables which she measured. For example, she notes:

> The strongest correlates of productivity improvements for all four systems are pre-use expectations about whether the system would increase productivity. Other determinants relate to the group context: leadership skill is important and strong competitive feelings may hamper productivity (Hiltz, 1988:1449).

In a similarly analytical approach, Suzanne Iacono and I (1988) examined the extent to which the development of a complex computerized inventory control system could best be explained by one of three different kinds of organizational choices processes: rational decision making, organizational drift, and partisan politics. In this study we presented a qualitative case study, and then systematically examined it for evidence in the form of episodes and social relationships which would support or undermine each of these three models of organizational choice.

I label this genre as analytical reduction because the authors reduce their accounts of the social world and computer technologies to a few key concepts. Depending on one's view, this approach represents the best or worst of social science inquiry. Those who see it as a valuable genre appreciate the way that the authors critically examine key concepts and examine the extent to which they shed insight into the social world of computing. They believe that our best hope for systematically understanding the social character of computerization will come from studies in this genre. Those who criticize, or sometimes even despise analytical reduction, see it as arcane and inaccessible except to academic specialists. They usually prefer social realist studies because they are more easily accessible and identifiably concrete. Further, the quantitative reductions are less likely to characterize the shifts of understandings that participants have over time, the nature of unusual but important events, or even the occasions when computerization becomes comical or tragic.

HYBRID DISCOURSES

I have identified five genres of investigation and writing as ideal types. While many articles and books clearly fit one of these genres, some works are hybrid. For example, some works combine key facets of social realism and anti-utopianism. David Burnham's The Rise of the Computer State is a passionate examination of the way that many computerized data systems operated by credit reporting agencies, medical information bureaus, police agencies and so on reduce personal privacy in the United States. His book reports his investigation of several large data systems based on dozens of interviews. Burnham is insightful in identifying the ways that large scale personal information systems have eroded personal privacy. He views each system as a medium for personal abuse -- as examples of organizations intruding unfairly upon people's private lives. For example, he discusses the Parent Locator System which uses matching on a complex array of Federal and State systems to track parents (usually fathers) who avoid paying legally mandated child support by hiding, often in another state. In this discussion he criticizes the system, sometimes obliquely. But he doesn't suggest that it has any socially redeeming value, even if, on

balance, he would disagree with the tradeoffs made by using it. I see his book as reflecting a strong anti-utopian orientation mixed with a social realist format. Burnham's anti-utopianism is particularly clear when his book is read in contrast with Ken Laudon's Dossier Society - a social realist study which criticizes many key aspects of computerized police systems.

Another hybrid work is Shoshana Zuboff's In the Age of the Smart Machine which is the most daunting and serious recent study which examines the labor processes and phenomenology of work with computer-based systems. She provides vivid and often brilliant descriptions of the phenomenology of work with special computer systems in specific work settings. She examines several cases of computerization in white collar offices and in the control room of a paper factory, thus giving the book the appearance of social realism. She draws on labor process theories of work, and develops an interesting theoretical argument. But her book is also driven by a significant anti-utopian subtext since all of her white collar empirical cases (and drawings which illustrate them) conclude that computerization has uniformly degraded work. The body of empirical research literature shows that computerization has not altered white collar work in such a unidirectional manner and that there are many technological and social contingencies which Zuboff ignores (Kling and Iacono, 1989).

The books by Burnham and Zuboff illustrate only two of a myriad of hybrid patterns. Hybrid works are quite common. They can avoid some of the problems of their component genres if they are carefully developed (e.g., Datawars by Kraemer, Dickhoven, Tierney and King, 1987 which mixes social realism and analytical reduction); or they can suffer from some of the fatal problems of their underlying genres if their authors do not take special pains to resolve these limits (e.g, Zuboff, 1988; Forester and Morrison, 1990; Forester, 1992).

CONCLUSIONS

I have identified five important genres in the literature which claims to describe the actual nature of computerization, the character of computer use, and the social choices and changes that result from computerization: utopian, anti-utopian, social realism, analytical reduction and social theory. There are other important genres that I have ignored in order to maintain some focus. This paper indicates the way that the conventions of genres like these amplify some kinds of ideas and mute others. They also make the resulting narratives accessible and attractive to different audiences. This attention to genre conventions blurs the crisp boundaries between fiction and non-fiction.

Writings in each genre have formulaic limits, much in the way that romantic fiction (or any other literary genre) has important limits (Cawelti, 1976). Cawelti notes that "The moral fantasy of the romance is that of love triumphant and permanent, overcoming all obstacles and difficulties (Cawelti, 1976:41-42)." This does not mean that we can't be entertained or our appreciation of life

enriched by romantic fictions; it is simply a genre with important formulaic limits. The moral fantasies of technological utopianism and anti-utopianism similarly limit the way that

they can teach us about the likely social realities of new forms of computerization: one is romantic and the other is tragic. I am not arguing for some simple "balance" in each account -- and especially not for balance between the utopian and anti-utopian genres. Life is more than a balance between romance and tragedy. (For example, neither romances nor tragedies frequently illustrate effective negotiations over vexing problems). I am much more sympathetic to the empirically oriented genres -- social realism, social theory and analytical reduction, than to the utopian and anti-utopian lines of analysis that I find less credible. But I see the two utopian genres as legitimate, for they help explore the limits of the possible. Social realist accounts are usually so anchored in the present that they don't examine long term possibilities very well. The social theories of computerization are a relatively new mode of analysis which transcend the particularism of social realism. However social theorists tend to "totalize" their narratives by emphasizing their key concepts and underplaying events and data which don't fit the conceptual scheme. Analytical reduction can be arcane for non-specialists and is most accessible to social scientists.

It is easy to identify the two utopian genres with Ideology and the three sociological genres with Science. This polarity captures important contrasts. But it is also too facile because all discourses, even scientific discourses, make ideological assumptions. Conversely, even the most blatantly ideological analysis can make some valid empirical claims.

In the 1990s, there will be a large market for social analyses of computerization stimulated by:

- the steady stream of computing innovations;
- the drive by academic computer science departments and funding agencies such as the U.S. National Science Foundation and Advanced Research Projects Agency to justify large expenditures on computing and telecommunications research;
- justifications for major national computerization pro- grams, such as the High Performance Computing Initiative, the National Research and Education Network (NREN), and the National Information Infrastructure; and
- articles examining life and technology in the 21st century.

A large fraction of this literature will be written by technologists and journalists for diverse professional and lay audiences. However, utopian analyses are most likely to dominate the discourse because most authors will champion special computer technologists or align with their champions.

The causal simplicity of technological utopianism and anti- utopianism is deceptive. But utopian and anti-utopian lines of analysis are legitimate and useful genres for helping us to understand how new technologies expand the limits of the possible (Kumar, 1991:106-107). But they are insufficient for creating an adequate literature about the social character of computerization. Moreover, organizations that have tried to computerize with utopian blueprints have often found that actual technologies are much more costly, complex, and problematic while providing much less value than the utopian analysts suggest when they are taken literally.

The actual uses and consequences of developing computer systems depend upon the "way

the world works." Conversely, computerized systems may slowly, but inexorably, change "the way the world works" -- often with unforeseen consequences. A key issue is how to understand the social opportunities and di- lemmas of computerization without becoming seduced by the social simplifications of utopian romance or to be discouraged by dystopian nightmares. I see both kinds of images as far too simplified. But they do serve to help identify an interesting and important set of social possibilities.

The main alternatives, social realism, social theory, and analytical reduction, are less likely to be produced in comparable quantity. They are relatively subtle, portray a more ambiguous world, and have less rhetorical power to capture the imagination of readers. However, social realists have not developed systematic strategies for analyzing the social character of powerful technologies that are not yet available, in use, for the kind of highly nuanced empirical observation which is the hallmark of the genre. Journalists probably produce the largest number of social realist accounts, although they also write stories which fit within the utopian genres. Social theory and analytical reduction are the specialty of social scientists and relatively inaccessible to non- specialists. Few scholars have examined computerization with a social theoretical perspective. The scholarly literature about computerization is relatively unknown to journalists, computer scientists, and computer professionals.

Even though they are much more scientific than the utopian genres, the sociological genres don't seem to appeal to many scientists and engineers. Some technologists dismiss social realist accounts as "primarily anecdotal," and they have little patience for social theory. For example, articles from these genres are rarely published in highly visible North American journals like Scientific American, Science, and IEEE publications. Fortunately, they appear periodically in some ACM journals, such as Communications and Transactions on Information Systems. I see the development of systematic social analyses of computerization -- that are both credible and compelling -- as a major challenge for the 1990s.

It is ironic that computing -- which is often portrayed as an instrument of knowledge -- is primarily the subject of a popular and professional literature that are heavily weighted towards the less reliable utopian genres. Conversely, the more trustworthy empirically anchored genres often have much less appeal in the scientific and engineering communities.

A major purpose of this paper is to advance our understanding of the social aspects of computerization by examining the kinds of stories that we tell ourselves and our audiences. The recent advances in applying and developing social theories pertinent to computerization have given us one important basis for some more credible and compelling stories. But social theory also has important limits based on the conventions of theoretically writing. I don't believe that we can develop "conventionless genres," even though we can benefit from new genres that situate computerization in credible social worlds. At this time, it's tempting to explore new genres that combine the richness of social realism with the future orientation of the utopian genres.

But we gain much by understanding the way that the conventions of any genre of social analysis amplify the possibility of some kinds of insights while moving other kinds of

insights from view. I believe that we have the most to learn from rich literature's about computerization in social life which give us diverse credible narratives. This is different from hoping that some new genre will help answer all critical questions in a compelling manner. We are much better off with a diverse collection of credible materials that can tell us different kinds of insightful stories about the social aspects of computerization.

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