The High-Tech Workplace: Implications for Technical Communication Instruction

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SINCE 1981, BUSINESS, trade, and professional publications have focused sharply on trends resulting from the impact of computer technology on the workplace. For example, consider the following: Between 1860 and 1980, the proportion of American workers involved in agriculture and manufacturing declined from 83% to 30%. As advanced technology is applied to agriculture and heavy industry during the last decade of this century, the proportion of the work force employed in manufacturing is expected to decline gradually to about 3% (Best 63; Cook, "You Mean" 143). In contrast, since 1950, the number of jobs in service industries has risen by nearly 146% (Ehrenhalt 16). Today, 55% of the workers in the United States are employed in information industries. More people are involved in information-communication services than in mining, agriculture, manufacturing, and personal services combined. By 2000, 80% of the work force will be employed in jobs that involve either generating or transmitting information (Feingold 10; Cetron, Rocha, and Luckins 30). In 1980, there was one electronic work station for every twenty-three white-collar employees; by 1989, one for every two.

This growth in information technology portends enormous changes in the way managers obtain information, make decisions, and perform their work (Gray 69). With data processing, telecommunications, and administrative services now merged, the $200 billion electronics industry plays the central role in the United States and the world economies that automobiles played in the past. Communication equipment and services are expected to contribute about 40% of world industrial value—or about $1.5 trillion per year—by the turn of the century (International Data, "Revolution"; A. Smith). The Information Age, not the Industrial Age, now defines the world of work (Drucker). The replacement of brawn industries with brain industries has changed both the jobs available to college students and the competencies necessary to perform these jobs. Because the goal of technical communication courses is to prepare students to communicate successfully at work, technical communication teachers need to understand how the emergence of the Information Age is affecting

the work environment and how changes in work will alt[illegible]hat we should teach.

Information Technology and the Redefinition of Work

Steady advances in computer technology and information systems are making many jobs obsolete and drastically reshaping others. One result is large-scale dislocation of employees, many of whom are undereducated for high-technology jobs and have no place to go (Ehrbar; Banks; Horvath). Despite the addition of over 10,000 new job titles to the Department of Labor job list, many jobs our students will hold a decade from now do not yet exist. Students must be prepared for the possibility of working in areas totally unrelated to their academic fields, and they should know that formal academic training for these coming jobs will not always exist (B. Jones 181; Cook, "The Knack"; Mattill; Salino; Schlefer).

To remain employed in an unpredictable job market, students can no longer depend on the future relevance of today's technical knowledge, which is becoming outmoded by the growth in knowledge stemming from information technology. According to one study,

> The half-life of an engineer's knowledge today is five years. In 10 years, 90 percent of what an engineer knows will be computer-related. Eighty-five percent of the information on National Institutes of Health computers is upgraded every five years. The rapidly changing job market, along with the changing requirments of new technologies, will necessitate increased training across the board. Up to 4 percent of the labor force will be in job retraining programs by the 1990s. Because of fundamental changes in the economy, there will be fewer and fewer well-paying jobs not requiring advanced training. . . . Schools will be used to train both children and adults. The academic day will be lengthened to seven hours for children; adults will work a 32-hour workweek and prepare for their next job in the remaining hours. (Cetron, Rocha, and Luckins 33–34)

Formal education will remain crucial ("The Growing Need"). Education that prepares students for the uncertain decades ahead will emphasize analytical skills, learning strategies, and concepts rather than technical detail. As Samuel Ehrenhalt of the Department of Labor has predicted, "If anything, the character of work is continuing to become less routine, more problem-solving, and above all, more changeable. That requires a mobile, flexible, adaptable labor force. The ability to learn will, in my view, emerge as the premium skill of the future. It is not what you know that will be the key to success in the emerging economy, but what you can learn—and how fast" (15–16). Managers, technicians, and engineer-scientists must be able to live and produce in an environment where holistic and relational thinking is routine (Rehder and Porter 53; M. Thomas; Kotter). Because work will become increasingly computer-

mediated, tasks will be accomplished through information systems rather than through direct physical contact with the object of the task. Imagination, analysis, and the ability to create theoretical insight, rather than hands-on experience, will become essential competencies for developing concepts to handle the growing masses of available information (Zuboff; United States Congress). Because what one learns today will quickly become obsolete, staying employed will require commitment to a lifetime of learning.

In short, technology has changed not only work and the knowledge required to perform work but also national and international economics, demographics, and the structures of society. As studies in the entire issue of the Fall 1987 *Occupational Outlook Quarterly* indicate, employees can anticipate several career changes during their lifetimes. As jobs and careers become obsolete, they will be replaced by new kinds of work requiring new kinds of training and relocation to a constantly changing array of work sites, many beyond United States boundaries (Kutscher; White).

Information Technology and the Redefinition of Communication Skills

From a communication perspective, the massive generation and dissemination of data and information from knowledge industries mean that communication skills will continue to be essential for a successful career and that the demand will grow to help others plan, manage, evaluate, and disseminate information to a wide range of users, many of whom will have inadequate literacy skills. Communication skills will be redefined as the ability to handle vast amounts of information and to adapt it for a wide range of users: the foremost problem that will confront employees in the information society emanates from the quantity of information being continuously generated. Because the amount of information generated doubles every two years or less, the central question becomes how to handle it—access it, manage it, use it, and help others use it.

From an organizational and a communication standpoint, a major concern is that information is not being managed. "It is available in overabundance or not at all. Seldom timely or complete, it is provided at a cost that cannot be determined and is given almost totally subjective value" (Connell 29). Information accumulates in additive, digital lists, while meaning, being subjective and referring to synthetic or holistic properties that cannot be reduced to the sum of parts, does not come easily or inevitably from a growing heap of mere information (Klapp). The problem during the next century lies not in the amount of scientific information available but in how to recognize and gain access to the value and significance of a large body of data. Such a plethora of technical options has been made available that society is threatening to fall behind in the orderly processing of information (Horowitz 630).

Managing information overload will require employees who can effectively

deal with people, organizational problems, oral and written communication, economic and financial analysis, and computer-information systems—in short, employees with a broad education rather than with a specialized training in a narrow field (Gray; Kiplinger 42; Jackson; Hull and Pedrotti). Communication skills will focus on successful extraction and adaptation—on knowing how to sift, select, shape, and present information to users as well as how and when to use graphics and oral media as replacements for written communication. Clarity and conciseness will also continue to be important qualities, as employees will be inundated with information that they need to understand and apply quickly and effectively; minimizing paperwork will also be a growing trend (Lampe; Denise; Pittel). Because communication skills will be essential in making information useful, analysis of audience (users) will become even more crucial to meet new, more demanding communication situations than those now confronting us.

Information Technology and Organizational Communication

Communication technology is also reshaping organizational hierarchies and the way decisions are made and communicated in organizations. Because rapid changes in technology require rapid decisions, rigid, multilevel hierarchies in organizations are being replaced with less complex decision-making structures requiring fewer levels. Z theory has made participatory management more widespread, and networks—composed of individuals from several areas of the organization—are being used to solve problems. These decision-making teams merge representatives from traditionally separate business functions (design, engineering, production, purchasing, distribution, marketing, sales, e.g.) into a problem-solving body. An employee's effectiveness in this kind of decision-making group will depend on communicating clearly, understanding the perceptions of others, and knowing how to work comfortably with individuals with diverse technical and organizational backgrounds. No hierarchy controls this kind of problem solving; solutions may come from anyone. The collective capacity of the group becomes something more than the simple sum of its members' skills; paperwork is kept to a minimum; and the network itself dissolves after the problem is solved. Employees may find themselves working in several networks at once, each brought into existence to solve an immediate organizational problem. Rigid, extensive communication hierarchies in organizations, such as those described by Mathes and Stevenson in 1976, are diminishing (Reich; Fraker; Brightman and Verhoeven; McInnis; Hine; Grayson, "Networking").

As teleconferencing, computer conferencing, and electronic mail expand, writers often "communicate" only by computer with individuals or groups of individuals unknown to the writer. When communication becomes only com-

puter-mediated and when face-to-face communication is not possible, behavior in the communication process changes. Research has already shown that great care needs to go into the design of computer messages, with emphasis on the following points: building sentences that are semantically and syntactically unambiguous, developing messages that are concise, and avoiding a tone that is overbearing in trying to reach the audience beyond the computer. Communication strategies change dramatically when common dramaturgical cues —shared psychological space, social space to produce cues necessary to create a shared experience, facial expression, tones of voice, and personal interaction with the audience—are missing (Sproull and Kiesler; Kiesler, Siegel, and McGuire; Wolff, "What You Should Know"; Grayson, "Productivity"; Magee and Little). Particularly in computer conferencing, writers may help build files of information that may be accessed by an unknown number of readers. In such a context, writers also have to be careful to provide clear background, rationale, and purpose so that readers can accurately and quickly perceive the significance and meaning of the material presented.

Information Technology and the Growth of International Communication

The high-tech information society has also merged telecommunications, data processing, and information management to produce worldwide communication systems (Walt). This reality means that an increasing number of United States industries will proliferate into multinational companies. The globe is rapidly becoming a single marketplace where goods are being made wherever they can be made the cheapest, regardless of national boundaries (Kiplinger 32–34; Bolt). The term "foreign affairs" is thus rapidly becoming an anachronism, and United States employees will need to know how to communicate with employees of different cultures and understand the culturally accepted prerequisites of communicating and working effectively with employees in other cultures (Moore; Ravitch; "Two-Hatted M.B.A.").

Planning Technical Communication Research for the Information Age

Teaching technical communication effectively in the constantly changing Information Age is not going to be easy. Textbooks are not adequate and probably never will be because of the lag between writing and publication. But new approaches in texts need to be attempted that reflect the broad competencies required for communicating in the high-tech workplace. Teaching generic reports and letters does not prepare students for the nongeneric kinds of writing now done routinely in high-tech organizations. Communication models do not

reflect problems of information overload faced by employees who have too much material to read and process. Cognitive researchers are only beginning to deal with decoding problems confronting receivers faced with heaps of raw data from which "meaning" must be extracted and then transmitted. Research results about effective use of voice, syntax, and graphics are far from consensual. Research in intercultural communication, human-computer interface, and the relations among data, information, and communication is still germinal. As Jim Corder stated so convincingly, we need a new rhetoric, and "If We Do Get There, There Won't Be There Anymore" (161). The new rhetoric must be one that deals with all kinds of discourse, visual messages, electronic communications, mass media, and the nature of knowledge (how we know what we know). Research in all these areas becomes imperative if we are to know and understand what we should teach.

In the meantime, we need to reexamine current communication models, survey trends in design of reports for electronic transmittal, learn protocols of communicating in other cultures, stay abreast of efforts to access data bases and information systems more efficiently, and continue research to determine how computer composing modifies the composing process. Never in the history of technical communication has practical, empirical research been so crucial to effective instruction.

Planning Instructional Changes for the Information Age

The inextricable role of communication in both the work environment and the definition of work itself suggests that professional communication courses will remain crucial. Changes in the work environment, moreover, have important implications for how we approach and teach technical communication, particularly on the advanced level, to ensure its relevance to students in the years ahead.

First, approaches to technical communication must reflect, more than texts currently do, the new constraints imposed by technology on the workplace. Specifically, the approach to technical communication must stress how communication in the high-tech workplace differs from communication in academic contexts. Advanced courses in technical communication can no longer be advanced skills courses. Instead, the focus should be on understanding the Information Age and on giving students practice in developing the competencies necessary for becoming effective communicators.

Second, for a number of reasons, we need to stop segregating our technical communication students according to their academic majors. On the job, students will collaborate with employees from diverse academic backgrounds. Many students will work in jobs unrelated to their academic fields of study. Studies of employee communication needs do not justify creating separate communication courses for students with different academic majors (Anderson, "What

Survey Research"). The increasing use of networks and other forms of small-group decision making suggests that students will benefit from learning to communicate with other students from diverse academic backgrounds. This kind of interdisciplinary communication environment, for which we should be preparing students, is clearly described by Thomas Peters and Robert Waterman throughout *In Search of Excellence* and by Peters and Nancy Austin in *A Passion for Excellence*. Business studies continue to emphasize that one solution to productivity and quality problems resides in breaking down barriers between technical culture and business culture and using continuing, interactive, dynamic planning and problem solving among areas within organizations (Cannon; Westwood).

Realigning courses to include students from a range of disciplines provides a laboratory setting where students can practice network problem solving that requires more than writing technical solutions to discipline-specific problems. In refocusing our courses to include networking, we can have teams of students from a variety of disciplines analyze and then recommend, individually and as a group, solutions to cases reflecting the kinds of organizational problems they can expect to face on the job. Group problem solving can also show students how oral and written communication relate and how written solutions often emanate from oral analysis.

Third, in response to both networking and the growing quantity of information, technical communication courses must intensify the study of audiences (as users of information), of the purposes for which information may be used, and of the contexts in which information may be processed and then applied. Writing assignments must help students understand how to generate reports from data, that is, how to extract information from quantities of raw data, analyze it, and sift, shape, and summarize it to enable readers to make efficient, accurate decisions. Students need to learn the difference between operational data and management data and understand how to highlight the significance of each type for the needs of a particular level of user.

Fourth, the massive training and retraining that provide displaced employees with new skills indicate that managers will need to know how to develop work procedures and instructions. Instructions and procedures should be emphasized in advanced professional-writing courses, but courses in designing and preparing training, operations, and procedure manuals should be added. Because computers are becoming the main means of providing continuing education, these courses should also cover how instructional materials can be adapted to computer presentation (Kendel and Benoir). Because many organizations are now developing their own business software or modifying existing software, courses in the development of effective user documentation should be made available on the graduate and undergraduate levels.

Fifth, computers have antiquated our traditional approach to teaching graphics. Instead of continuing to emphasize conventions for developing graphics and choosing the best graphic for a given kind of information, we need to develop case problems that require students to use computer graphics and data-

analysis packages to analyze and present information. Cases should be based on raw data that must be made meaningful to the intended users. The design of these cases needs to make two points clear: (1) in some cases, visual display is more effective than verbal presentation, and (2) writers will often have to decide when to use visual display and when to use verbal presentation.

Sixth, the growing quantity of information now available in every field has affected how we should teach research. While students need to learn how to use abstracts, indexes, and specialized reference materials in their fields, this approach by itself does not enable students to perceive the access problem caused by burgeoning data. We must also emphasize how current search systems are devised and organized, the kinds of systems available, theories of indexing, the changes that standard research systems (like card catalogs and major indexes) are undergoing, and procedures for developing search strategies to access online material. The stark fact is that no common computer protocol or language exists to synthesize the two or three hundred data bases currently available (Horowitz).

Seventh, because of emerging worldwide communication networks, students need to understand that communications they routinely generate on the job may be accessed and used by employees in other cultures who have access to global electronic mail and computer conferencing. Advanced courses and programs need to include instruction in intercultural communication: how to deal with cultural barriers and differences in planning and writing for multinational audiences. We also need to stress to students the value of a broad liberal arts education—for example, mastering another language and understanding other cultures and the political and religious systems that underlie intercultural communication barriers and existing protocols (Kiplinger 42; Wolff, "When Lab"; Steele; Maisonrouge).

But perhaps the most important change involves helping students understand the proper relation between computer literacy and human analysis and perception. Our instruction needs to make clear that the burgeoning growth of information has transformed the communication process but that giving readers information does not mean that communication has occurred and that computer literacy and word processing are not substitutes for knowing how to communicate or for understanding the process for developing communication. Students need to understand that quantities of information and advances in information systems do not inevitably make us better informed or inevitably enhance our comprehension of information (Wessel; Dreyfus and Dreyfus). As An Wang has stated, our entire thought and meaning process is impervious to automation (International Data, "Office Systems"). Computer and word processing skills are no substitute for the ability to analyze, to create the shared-language experience necessary for writer and reader to communicate. Word processing often disguises noncommunicating information clothed in grammatical correctness (Parret).

Ultimately, the increasing speed by which information is generated and documents are processed makes even more important the need to stress the

main principle that underpins every professional writing course: "Communication occurs when people are led to experience shared perceptions and assumptions about what is real, what is relevant, and what is important in a particular situation" (Sanderlin 42). Our students must understand that sifting through and analyzing the growing pool of information on every subject is only the first rite of passage to the more demanding exercise—the painful intellectual deliberations enabling us to help readers gain understanding. Information itself does not dispell ignorance. Knowledge does (Landvater; Menofsky; M. Nelson).

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