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7 Reinvention in the Innovation Process: *The Case of Word Processing*

Lord Wen-hui watched in amazement as his cook Ting carved the roasted ox with speed, grace, and rhythm. "Imagine skill reaching such heights!" he marveled. Cook Ting replied:

> A mediocre cook changes his knife once a month—because he hacks. A good cook changes his knife once a year—because he cuts. I've had this knife of mine for nineteen years. There are spaces between the joints, and the blade of the knife has really no thickness. If you insert what has no thickness into such spaces, then there's plenty of room. . . . However, whenever I come to a complicated place, I size up the difficulties, tell myself to watch out and be careful, keep my eyes on what I'm doing, work very slowly, and move the knife with the greatest subtlety [Watson, translator, 1964: 46-48, rearranged].

We might extract from this lesson by Chaung Tzu insight into the adoption of information systems: Uninformed and unmanaged implementation of new office media (no matter how sophisticated or powerful) will both dull the potential of the technology and shred the social fabric of the organization. We argue elsewhere (Johnson and Rice, 1983) that to understand the potential of new organizational media, "one needs to understand the essential nature of information work, with particular emphasis on understanding how we do such work, and how we might redesign it" (Bair, 1979; Giuliano, 1982; Paisley, 1980; Rice, 1980a; Strassman, 1980).

Office work is information work and, more fundamentally, communication, and it requires communication. People in offices manipulate symbols. Many symbols are combinations of verbal and numeric symbols: justifications, reports, budgets, requests. Although most symbol-manipulation by managers in offices is oral, clericals typically manipulate textual symbols (see Chapter 8). Using new organizational media, office personnel can support the organization's goals through processing symbols more effectively and through attending more closely to the meaning and significance of those symbols.

Organizations are networks of information flow; therefore, directing flow to the right places, filtering it in useful ways, and even preventing it from flowing to certain locations improves organizational performance (Galbraith, 1977; Rogers and Kincaid, 1981; Tichy, 1981; Weick, 1969). Simon (1973) and Strassman (1980), among others, argue that the primary goal from this perspective is not to produce more information, but rather to reduce the amount that any one subsystem must process. Indeed, Simon argues that a very scarce resource in organizations is attention. Information and information systems should be used and designed so as to free up this scarce resource for more crucial and strategic tasks. Developing information systems that accomplish these goals requires new ways of doing work, not just more efficient ways of doing the same work.

This chapter discusses how organizations adopt, use and adapt word processing (WP). Three reasons make the history of WP significant in understanding organizational information systems. First, processing and communicating text is crucial to the functioning of organizations. Second, in many organizations, WP is an early step toward office automation or the "office of the future" and thus can provide fruitful lessons for such developments. Third, in spite of the emphasis in the popular literature on managers and their executive work stations, clericals in many organizations are the first outside of data processing or programming personnel to confront automated information systems. As a small measure of this exposure, consider that projections call for 40%-50% of the U.S. information work force to have work stations by 1990—32 to 38 million work stations with an average investment of $25,000. More than 400,000 WP units alone are expected to be delivered in 1984 (International Data Corporation, 1983).

After a brief discussion of developments in office technology leading up to current WP systems, following sections will (a) introduce the data we report throughout the chapter and describe (b) the adoption model we use in the context of implementation of information systems, (c) the notion of reinvention in the adoption process, (d) "standard" WP and adaptations, and (e) the role of communication in making transitions from fancy typing machines to the integrated office.

DEVELOPMENTS IN OFFICE TEXT PROCESSING

The steel pen nib, introduced around 1850, was arguably the first step toward the mechanization of office information systems (Giuliano, 1982). At that time, scribing, drafting, and copying text was the domain of gentlemen who had received specialized training in school. Document storage was cumbersome; incoming correspondence was kept in pigeon holes, boxes, or whatever scheme suited the office manager. Copies of outgoing correspondence were kept chronologically in large flat books. Records processing consisted of the keeping of books—large bound ledgers—and making copies by pressing inked sheets between tissue paper. This procedure not only made it physically difficult to search for portions of a client's file, but there was no necessary linkage between incoming and outgoing portions.

On the other hand, internal written office communication as we know it (memos, written rules) hardly existed. (See Markus and Yates [1982], Whalen [1983], and Yates [1982], on which parts of this discussion are based.) It was considered the duty of a manager to be knowledgeable enough about his business not to require recourse to any record system other than his memory.

Written communications were encouraged by a vast efficiency in storage and retrieval, made possible by the development of the vertical file. The vertical file actually combined three inventions: a storage medium, a duplication facility, and an indexing system. Flat files replaced bound ledgers, and were quickly improved to become cabinet files by 1881. The loose-leaf ring binder, introduced in 1894, further increased flexibility in office records and led to the idea of interchangeable parts and an information system. The inking of the ledger's tissue sheets was replaced by (a) a roller copier, (b) carbon copying (which took until about the 1910s to be accepted), and (c) Edison's mimeograph, introduced in 1870. The third component was an indexing system to retrieve the documents, specifically the Dewey decimal system, accepted in 1876.

Libraries were the first to combine these components; indeed, card indexes diffused much more quickly than business vertical files. A library supplier introduced the vertical file at the Chicago World's Fair in 1893, and filing of separate, reproduced documents in upright filing cabinets was in widespread use by 1915; indeed, the first School of Filing opened in New York in 1914 (see Delgado, 1979). Such filing systems were the first random-access sequentially-organized data bases. Yates argues that the ability to file led to information overload and dissemination of document storage throughout the organization. The need for standardization of

filable documents led to written procedures and one-topic memos, specialization in text processing, increased internal correspondence, reduced autonomy, and "corporate memory."

The introduction of the telegraph (first demonstrated in 1844) decreased the effect of distance on business, but did not affect intracity communication traffic much. The telephone did that. Although direct dialing in switched local networks was available by 1899, operator-assisted service was available soon after Bell invented the phone in 1876.

Whalen suggests that railroads and the telegraph, along with increasing vertical and horizontal integration in industry (1880 to 1900), fueled a tremendous growth in transactions, which lead to an insufficient supply of male clerks.

Meanwhile, the aspirations and education levels of women were rising (see Aron, 1981). The introduction of the typewriter was inextricably linked to the insufficient male labor pool and the new female labor pool. The increase in women office workers was concomitantly dramatic. The 1880 census shows that only a tiny percentage of office clericals were women; by 1910, 83% were women (Scott, 1982: 173).

The concept of a typewriter fascinated inventors from as far back as Henry Mill in 1714. Over fifty inventors demonstrated writing machines before Sholes patented his version in 1868; it underwent 50 revisions before being bought by Remington. Typewriting led to a dramatic increase in dictation, hence facilitated the rise of the role of "personal secretary" and the segmentation of handling correspondence. By the turn of the century, shorthand and touch typing were widely used; more than 100,000 typewriters had been sold (Giuliano, 1982). The typewriter was seen at the time as a major revolution equal to the steam locomotive (Bliven, 1954; Curley, 1981).

A spate of inventions in office systems quickly followed. Edison's "business phonograph"—the dictation machine—was introduced in 1913, though it did not replace the stenographer. (That awaited modern office equipment, as stenography jobs declined 50% from 1972 to 1980; Giuliano, 1982: 154.) There were even early "automatic typewriters" based upon the player piano principle, using two rolls for form text and name lists, sold until after World War II (Leffingwill, 1926). Due to the Depression and reduced office work during World War II, there was little development in office products. Many have argued (although, ironically, without much documentation) that the photocopier ranks with the telephone, typewriter, and computer in significance for office work. The mainframe computer of course transformed the way organizations handled transactions and personal computers promise to continue the trend, but those topics are outside the scope of this discussion.

The development of word processing began as the marketing concept of a German IBM products manager (Steinhilter), who saw the magnetic tape/selectric typewriter (MT/ST) as an improvement over the paper-tape Frieden Flexowriter automated typewriter (Curley, 1981). He convinced IBM of the possibilities, and they marketed the term "word processing." They also marketed the idea of reorganizing the office around centralized

transcription pools so dictation could take advantage of the costly equipment. Centralization as an organizational concept was advocated by IBM, until recently, and made a permanent mark on the use and design of office technology.

The MTST was introduced in 1964 and used tape cassettes to store short text material. Storage was increased in 1969 with the IBM CMST, or mag card typewriter. WP developments followed rapidly, and included Lexitron's introduction of a video display in 1972 that allowed correction of errors before printing. Vydec's floppy disks, introduced in 1973, offered random access to text. Programmable WP software appeared in 1977 from Lanier; multiple functions were soon added by the IBM 6670 in 1979. The concept of integrated data and text was manifested in Jacquard's offering in 1979. Prime, Wang, Xerox, and Datapoint introduced networking in 1980. Managerial terminals were available from Xerox the next year. The Wang Alliance system offered multiform data and integrated functions that year as well.

Word processing now takes many forms. Hardware includes electronic typewriters, stand-alone nondisplay or single line-display storage typewriters, stand-alone display processors, clustered systems, hybrids (with multifunction intelligence), time sharing with internal or external mainframes, and now desk-top microcomputers. Uses of word processing also differ widely and seem to result from differing patterns of implementation. The next section describes a project intended to find out more about how organizations adopt and use word processing.

DESCRIPTION OF DATA AND RESEARCH METHODS

The project on innovation in word processing was funded by the National Science Foundation, and had two phases. In phase 1, we conducted telephone interviews with respondents at each of 194 organizations that had adopted WP at least two years before and that had at least four WP terminals. Contact respondents were recruited from lists of members of WP associations, from students in professional night schools, and from directories. Whenever possible, we contacted directly the person with supervisory responsibility of a unit. Respondents were mostly female (70%) holding the title of word processing supervisor or manager (42%) or systems manager or information, administration, or office (24%). The organizations represented a cross section of business: federal (27%), private nonprofit (14%), private profit (50%) and private regulated (7%). These also had a wide range of employee population size: fewer than 100 (14%), 100 to 400 (23%), 401 to 2,000 (32%), 2,000 to 20,000 (20%) and over 20,000 (10%).

Sixty-three percent of the organizations employed fewer than 15 WP operators, and an additional 17% employed fewer than 25. WP centers, with or without satellite work stations, made up 80% of the sample. In the remaining 20%, equipment was distributed among secretaries or professionals. Our sampling approach likely overselects from the more "central-

ized" units, because it is harder to identify respondents in organizations with distributed WP use.

In a second round of data collection and analysis, we selected 60 sites, for follow-up visits, interviews, and questionnaires with managers, authors, and operators. Case studies were constructed from these interviews, and the questionnaires asked for attitudes, uses, and perspectives specific to each group. Overall, sample sizes of these three data sets are managers—80, operators—302 and authors—243.

We posed three research questions:

(1) Do organizations vary in their uses of and procedures for word processing?

(2) How do word processing adaptations evolve?

(3) What predicts the development of adaptation?

We discuss differences and similarities among organizations with respect to (a) whether or not there is a "standard" form of WP, and (b) four kinds of word processing/information systems. Systems here are considered in light of implementation and innovation theory, and constitute managerial philosophies, supervisory actions, work unit communication, and level of technical integration. The following section considers relevant aspects of implementation research.

FACTORS IN INFORMATION SYSTEM ADOPTION

The literature on innovations in general and on implementing information systems in particular is voluminous (Ackoff, 1967; Bikson, Gutek, and Mankin, 1981; Danzinger, Dutton, Kling, and Kraemer, 1982; King and Kraemer, 1981; Lucas, 1981; Rogers, 1983; Sheposh, Holton, and Knudsen, 1982; Zaltman, Duncan, and Holbek, 1973). Any review of this literature is beyond the scope of this chapter. However, we can note some of the common threads to this research.

The factors most common to implementation success include the rationale(s) for adoption, key actors, the distribution of the innovation within the organization, flexible planning, incremental change, pilots targeted to specific groups, user participation, training and face-to-face facilitation, and incentives for accepting change (Bikson et al., 1981; Keen, 1981; Meyer, 1983a). Hopelain (1982) suggests that successful implementation tends to be stimulated by dissatisfaction with current quality and location (or control) of data, accessibility of adequate organizational resources, and agreement about basic issues (technical, organizational, or interpersonal) on the part of involved parties. Underneath the appearance of administrative efficiency and precise decision making, even the most successful innovation is likely to be an instrument of organizational politics (Bikson et al., 1981; Danzinger et al., 1982; Feldman and March, 1981; Keen, 1981; Kling, 1980).

Dutton (1981), Keen (1981) and Markus (1981) and other authors take the "segmented institutionalist" perspective described in Chapter 3 when analyzing the politics of implementing information systems. Dutton, for example, concludes that "information systems seem to be highly malleable political tools which are utilized to reinforce the interests of the dominant coalition within an organization" (p. 200). He claims that consensus is not a likely outcome or safe assumption when implementing systems because of (a) unavailability of appropriate data for support or rejection of claims or even for the system's requirements; (b) organizational complexity, including too many actors; organizational instability, such as managerial mobility; (c) personalities of the actors; (d) shifting political environments that make the system appropriate or inappropriate at different times for different groups; (e) different stages in the innovation's lifespan which activate different groups; and (f) multiple, changing agendas.

Keen (1981) goes further in reassessing the notion of "rational" rationales for information systems. Information is, after all, only a small component of decision making, and is clearly an intellectual and political resource that affects various groups. Because of pluralism of goals, overt counterimplementation and resistance are not only likely, but even quite rational for the various organizational actors. Resistance is seen as a sign that some group doubts the official cost/benefit ratio of the innovation. (See also Zuboff [1982], who emphasizes that managers should pay attention to the form and source of resistance as guides to implementation, training, and job design.) In general, Keen focuses on politics, negotiation, authority, and coalition-building (as does Meyer, 1983b).

The comprehensive review by Sheposh et al. recognizes the prevalence of resistance, but warns that this may have been overemphasized in the literature. As they summarize (1982: 47), individuals are

> oriented not only toward defense of the status quo, the maintenance of consistency and the reduction of ambiguity, but also toward new learning, self-utilization and development of competence.

We agree, and will discuss how managers can foster these more positive reactions to implementation.[1]

THE PROCESS OF ADOPTING WORD PROCESSING

Implementation, however, is but one aspect of innovation adoption. This section describes a stage or process model of innovation, using word processing data for examples. The adoption process has also been characterized in the form of various stages. These may include a progression from knowledge/awareness, formation of attitudes toward the innovation and decision, to initial implementation and sustained implementation (Zaltman et al., 1973), or from evaluation and implementation to routinization (Hage and Aiken, 1967). We summarize a five-stage model of adoption developed over the years by Rogers (1983) and others (see

Rice and Rogers, 1980), highlighted by data from the WP project and mention of various perspectives that seem useful at each phase.

Agenda-Setting

At this initial stage the organization defines in a general way its problem; this definition includes the development of a common recognition of the problem by interested organization members. Early research assumed, at least tacitly, a rational perspective underlying agenda-setting. Organizations investigated their problems systematically, ordered their goals, and established objective criteria for selecting solutions. We have seen that this perspective is insufficient: "decision-making is multifaceted, emotive, conservative and only partially cognitive" (Keen, 1981: 25); "a WP system is part technology and part ideology" (Williams and Lodahl, 1978: 11).

In our study the initial rationales for considering WP were very utilitarian, yet may in the long run be quite limiting. Table 7.1 shows that the majority of organizations reported "repetitive typing" as the rationale, followed far behind by improving the work unit or employment containment.

A survey by the journal *Word Processing and Information Systems* (1981; based upon 2164 WPIS readers, or a 19% response rate) and another by Curley (1981; based on completed questionnaires from 21 organizations out of 30) found similar rationales: document preparation, documentation, and some data manipulation in the first survey, and faster output, keeping up with increasing paper volume, and better quality output in the second. Curley found that 84% of organizations reported their initial use of WP was for form letters or extensive revisions. These are quite important rationales for justifying the first plunge into an expensive innovation, but the paradox lies in the fact that these uses do not change or improve the organization. Further, although they are based upon notions of increased productivity, secretarial typing costs constitute less than 5% of office costs (Bair, 1979; Tapscott, 1982: 20). Therefore, a narrow focus on repetitive typing misses considerable potential of office automation, even on grounds of narrow productivity measures (see Chapter 8).

Matching

Matching is the stage at which a general problem from the agenda and a possible solution are brought together. The implementation literature emphasizes that top support is important for success; indeed, in most of our sites the initial idea came from top management. In 61.9% of responding organizations the idea for WP initially came from executives or top management, 10.7% from clericals and 10.1% from clients or professionals. The WPIS survey found that 77% of those deciding initially to buy WP were chief officers—fully 25% were the organizations' chief

TABLE 7.1 Rationales for Equipment Installation and Subsequent Change

	Rationale for Initial Installation	
Rationale	*First* [a]	*Second* [b]
Repetitive typing	66.3%	15.8%
Improve work unit	13.5	32.7
Reduce or maintain staff	11.0	11.9
A new thing to do	7.4	5.9
Other	1.8	33.7

	Rationale for Subsequent Change	
Rationale	*First* [c]	*Second* [d]
Upgrade functions	33.6%	48.5%
Dissatisfaction	26.8	13.9
Add features	22.8	14.9
Added demand	12.8	10.9
Managerial decision	2.0	2.0
Compatibility	—	5.0
Other or none	2.0	5.0

a. N = 163
b. N = 101
c. N = 149
d. N = 101

executive officers. Curley reported less of an influence of top management—only 38%; 46.7% were individual managers. But she notes that subsequent purchases, or companies deciding on WP later than average, were more likely (61.8%) to have top management make the decision.

Computing as well as WP seems to be initiated by a "godfather" who then delegates the idea to lower levels, where support may be less visible or real. On the one hand, this explains the excessive rational perspective behind initial usage justification, but also explains why these justifications rarely consider changing the nature of work: High-level managers are not sufficiently involved in the work process to suggest those kinds of changes. As we will see, such change in work design, rather than in technology, must come from the locus of activity.

In addition to lack of support at the operational level, the person put in charge of the WP unit was typically a secretary or WP operator (72.7%) with no experience outside the organization (61.5%). In many cases it was the executive's secretary, or an operator in the original WP unit who felt someone had to take charge.

During the matching stage, certain characteristics of the innovation influence its adoption. *Relative advantage* is the degree to which a new idea

is perceived by the user as superior to the practice it replaces. Clearly reduction of repetitive typing makes it easier to see the obvious relative advantages of WP.

Complexity is the degree to which an innovation is perceived by the user as difficult to understand. The early WP technology was seen as quite similar to typewriters and, thus, was conceptually simple, but was also limited in functions and not easy to operate. Current WP systems are highly functional and, thus, easy to use for certain tasks, but they do allow highly complex procedures. Indeed, the median number of months the operators reported needing to become competent was a short 1.6 (mean = 2.7), but 72.4% reported that they are still learning "some" or "much" about ways to use WP.

Compatibility is the degree to which a new idea is perceived as being consistent with the potential adopter's prior experience, beliefs, and values. Placing WP into stenolike centralized "pools" reduced the initial perceived incompatibility of WP by including it in existing procedures and operations, but the potential of WP is often limited by fitting it to preexisting procedures.

Communicability is the degree to which a new idea is visible to potential adopters. Here the product is quite visible—rapidly produced, correct, formatted, clean copy. Thus, this quickly becomes the standard for demands by authors. However, the process of WP is nearly invisible to clients, so tensions quickly arise between author expectations and WP unit capabilities.

Divisibility is the degree to which a new idea can be given a small-scale trial by a potential adopter, or the extent to which parts of the innovation may be tried. Here there is often a large leap to the first WP equipment, so divisibility is not a strong attribute of WP. Further, attempts to keep initial WP simple also work against developing managerial expertise and effort in designing the unit's structure and procedures.

We see that many of the attributes of WP that facilitate initial adoption during the Matching stage may operate in the long run to either suppress its potential or generate organizational conflicts that must be resolved in later stages.

Redefining

In the redefining stage, attributes of the innovation are defined relative to the organization's needs. Incremental implementation facilitates this redefinition. An incremental approach, particularly through pilot demonstrations (either experiments, which provide more information about the innovation, or exemplary demonstrations, which try to display the innovation and its benefits), will uncover negative meanings and inappropriate design aspects. A system is more likely to succeed if people involved associate with it favorable—and realistic—meanings and expectations of the benefits (Lippit, Miller, and Halamaj, 1980).

In our sample, there seemed to be few extreme cases of either rapid experimentation or lengthy and large-scale initial implementation: The median number of months spent in planning was 6.3, with a mean of 8.1.

No more than half of the organizations spent "much" time in even lease-buy assessments of WP technology; slightly less spent "much" time in cost-benefit or work-flow assessments; less than a third spent "much" time in assessing employee attitudes; and only 12% made site visits (see Table 7.3 below).

Experience with WP leads to better understanding of its potential role within an organization. One measure of this is whether subsequent changes in equipment are motivated by different reasons than the initial rationales. Table 7.1 shows that although general dissatisfaction was responsible for 26.8% of the rationales, and added demand (an extension of the initial rational justifications) represented 12.8% of the changes, upgrading of functions (33.6%) and addition of features (22.8%) represented the majority of reasons. This may be interpreted as slight redefinition of the original concepts of WP, developed through actual use. The WPIS survey also reported what functions users wanted to acquire (thus their question is biased toward functionality). The most mentioned functions included more work stations, communication, additional software, electronic mail, and photocomposition interface. All except the first-mentioned reason imply redefinition of the initial role of WP as a way to reduce repetitive typing. Curley also reported a shift in top uses among her responding organizations: Broad correspondence was ranked first by 55%, word and data processing by 30%, and forms typing by 15%. In general, she concluded that there were no overall differences in initial and subsequent purchase rationales, although five organizations (24%) did argue for "soft" dollar savings, greater managerial productivity, and increased effectiveness as changes in cost-benefit criteria.

Another measure of redefinition is whether the functions that were performed were changed much over the implementation and usage period. Table 7.2 shows that regardless of the WP use, typically only about 10% of the organizations reported "much" change in the way these services were performed.

Thus, while there was a general redefinition of the kinds of reasons for which WP was acquired and reasonable amounts of effort were expended to match and redefine the innovation in a short period of time, the initial ways in which WP was used to perform services typically changed little.

Structuring

In this stage organization members establish the innovation within the organization's structure. Structuring occurs partially through peer pressure, negotiations and social modeling, and partially through formal and informal communication about the innovation (Rogers, 1983; Rogers and Kincaid, 1981).

TABLE 7.2 Word Processing Service Elements, Ranked by Frequency of Organizational Adoption

	Does Organization Provide Service?			
Uses	*Never*	*Occasionally*	*Regularly*	*Was Service Changed Much?*
Draft copies	7	26	158	23
Proofread	24	41	125	28
Index files	25	20	145	24
Boilerplates	42	49	99	25
Develop forms	53	51	85	14
Edit and rewrite	55	50	85	22
Fill out forms	61	47	83	20
Keep activity log	65	25	96	13
Maintain inventory	71	25	92	18
Maintain data base	76	27	85	26
Deliver work	69	44	65	4
Process records	82	36	66	15
Write original material	94	42	56	15
Telecommunicate	102	22	60	22
Provide admin. support	110	23	53	6
Provide photocopies	120	20	46	9
Phototypeset	153	9	26	6

NOTE: Figures are number of organizations giving that response, rather than percentage, to avoid difficulties with missing responses. Uses ranked according to total of "occasionally" and "regularly" responses.

A spurt in the acceptance and use of an innovation occurs when the opinion leaders in a system adopt an innovation. On the other hand, top management may encounter peer pressure and norms not to send one's work to another unit or not to use a keyboard. Indeed, among authors in our study there is a barely significant relationship (Kendall's tau = .395, $p < .001$) between doing any of one's own typing and interest in having WP on one's desk.

With respect to actual organizational structure, although 80% of the organizations had WP centers or centers with satellites, it was not always this way. When asked what was the growth pattern for WP, 28 (41.7%) organizations said "the same", 27 said "to decentralization", and 40 said "to centralization". Curley found about the same shifting, but she commented that the direction tended to be away from whatever structure was devised initially. She concluded that any change in organizational structuring was "reactive" and not necessarily directed by conscious choice or managerial planning.

Interconnecting

More than any other stage, interconnecting requires attending to processes brought into focus by the political and interactionist perspectives (see Chapter Three). Questions about turf, social benefits, control, and access rise; solutions are dictated or negotiated. Markus (1981) argues that adoption resistance can be largely explained by "features of the information system's design which represent a loss in power for affected users." Individuals' rules and departments must be interconnected and integrated within the organization.

The most common interconnection issue in our WP survey centered around the amount of access and contact authors had with operators. At the extreme, some authors lost their personal secretaries upon the development of WP, and thus felt a keen need to maintain contact with their documents and the operators. On the other hand, supervisors quickly became wary of easy access to their operators, and devised ways to protect the operators who were not in a position to negotiate author's demands. This is not to say that operators did not want some contact with authors. Of the word processing operators responding, 167 (62%) said they had "some" or "much" contact with authors, and this correlated (Kendall's tau = .60, $p < .001$) with how much they would like (they tended to want a little more). Nearly all authors (93%) reported "some" or "much" contact with operators, and slightly more felt that this improved the work. However, 49 of the organizations reported "many" and 88 "few" as opposed to 35 reporting "no" formal procedures for contact with authors. Thirty (65.2%) reported decreases in author contact, with 13 reporting increases.

REINVENTION OF WORD PROCESSING

How and whether WP is adapted *after* it is adopted is an important question. The potential of office communication technology may be facilitated by starting out with WP, but applications and work design must progress past those rationales and designs initially typical in most organizations. Thus, we are interested in reinvention in the innovation process.

Reinvention is the degree to which an innovation is changed by the adopter in the process of adoption and implementation after its original development (Rice and Rogers, 1980: 501). Reinvention as a concept has its roots in educational implementation studies. Berman and McLaughlin (1975), for example, noted the considerable "mutual adaptation" between educational organizations and their innovations. Hall and Loucks (1978) discussed the notion of "innovation configurations" or "the operational patterns of the innovation that result from selection and use of different innovation component variations." Perhaps the first use of the term "reinvention" appeared in Agarwala-Rogers, Rogers, and Wills (1977). As Rice and Rogers (1980: 501) have written,

· Reinvention may involve both the innovation as a tool and in its use. Thus, the same technological innovation may be put to a different use than originally intended; alternatively a different innovation may be used to solve the same problem. In addition, the intended or potential consequences of an innovation may be changed through reinvention.

Thus, reinvention may occur at any of the five adoption stages. The nature of reinvention may involve operations and service, technical aspects, or managerial and organizational aspects. Further, reinvention seems to be categorizable into planned (intentional) or vicarious (learning from other's mistakes) and reactive (solving a problem generated by the innovation) or secondary (solving unintended consequences elsewhere in the organization or innovation due to the reinvention).

Measuring Reinvention

A straightforward measure of reinvention is the number of innovation components over and above a "standard" configuration. Here, operation/service components are represented by WP uses or services. Table 7.2 listed WP services, ranked by decreasing frequency of adoption by the 194 organizations. If we define the standard adoption as those components adopted by at least 50% of the organizations, the standard service components include providing draft copies, proofreading, indexing files, and using boilerplates (standard forms and headings).

Technical and managerial/organizational components are included under "role and organizational structure" in Table 7.3.

The standard WP innovation (adopted by 50% or more of organizations) comprises units in centers (or with satellites) staffed by "WP/word specialists/technicians" working for a WP supervisor manager (the plurality category of titles). As we have seen, its main rationale is repetitive typing and is initiated by top management. Only lease-buy assessment is performed. There is much operator-author contact, though the WP unit has its own location and does not share it. Any changes that occur are primarily motivated by the supervisor.

The 50% criterion is rather arbitrary, if useful. Another way to detect the standard form is to inspect the distribution of the number of components adopted by organizations. For this analysis, all service and role/structure variables were dichotomized, then summed for each organization. For the 16 service components, the mean is 9.3, median 9.5. For the 23 role/structure components, the mean is 10.4, median 10.2. These values and Figure 7.1 indicate that the distribution of components is quite normal and we cannot conclude that a specific number of components in each set constitutes a clear standard adoption.

Another approach to identifying a standard configuration is to look for factors underlying the adoption of components. Tables 7.4 and 7.5 portray the orthogonal varimax rotated solutions to the service and role/structure variables.

TABLE 7.3 Word Processing Role and Organizational Structure, Ranked by Frequency of Organizational Adoption

Rank	*Role/Structure*	*Response Frequency*				*Number of Organizations*
	Title					
2	WP unit	Distributed				35
		Center(s) perhaps w/satellites				147
14	Operators	Secretary/Typist/Etc.				94
		WP/Word specialist/Technician				94
15	In charge	Other				104
		Supervisor/Manager				89
	Initial Idea					
9	Rationale	Other				55
		Repetitive typing				108
11	Source	Other				84
		Executive/Top management				104
	Assessments	None		Little		Much
8	Lease-buy	53		29		82
12	Cost-benefit	57		26		76
13	Workflow	66		21		75
17	Employee attitudes	85		23		39
	Client Boundaries					
4	Amount of contact	32		31		108
5	Procedural formality	35		88		49
		Never		Depends		Always
20	Chargeback	121		30		17
	WP Unit Evaluation	No				Yes
16	Line/Page/Doc Count	120				66
17	Turnaround time	125				62
17	Client satisfaction	120				62
18	Lead to changes	100				61
21	Errors	151				35
	Physical Boundaries					
7	Others share WP place	68				120
10	WP personnel one place	84				105
	Involved in Changes	None	Some		Often	Usually
1	Supervisor	17	15		25	119
3	Execs/Top admin.	37	68		28	49
6	Clients	49	72		29	28
19	Data processing	103	29		8	21

NOTE: Ranks based upon combined positive responses, or upon most frequent category of response, except for "In charge" variable.

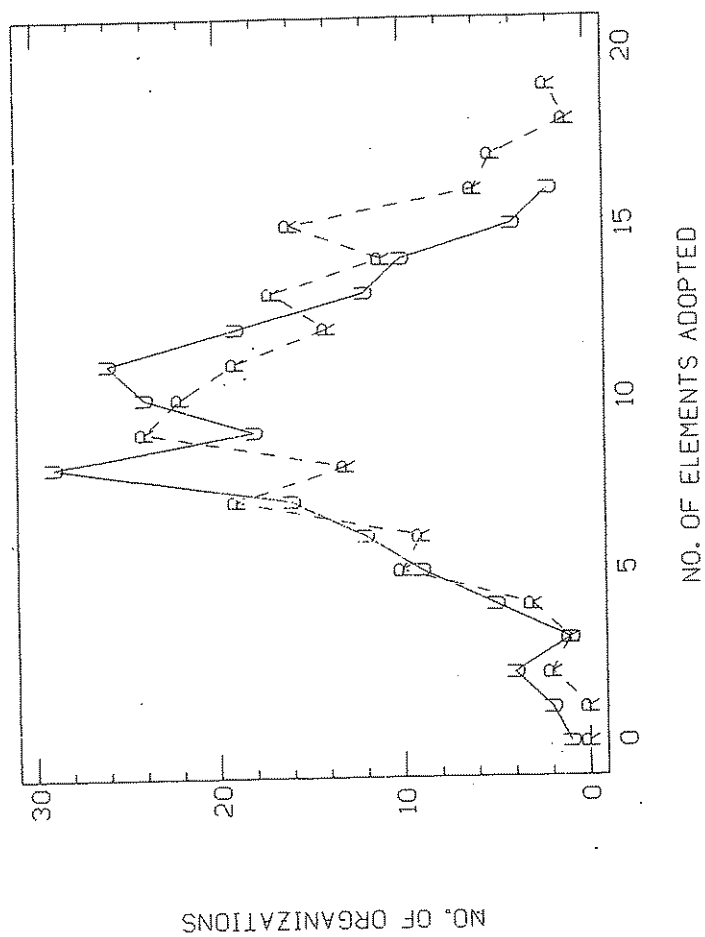

FIGURE 7.1 Distribution of Adoption of 39 Word Processing Components by 194 Organizations

TABLE 7.4 Factor Solution of WP Service Components

Uses	*Factor 1*	*Factor 2*
Draft copies	Not included due to wide adoption	
Proofread		
Index files		
Boilerplates	.42	
Develop forms	.60	
Edit and rewrite		.50
Fill out forms		
Keep activity log	.40	
Maintain inventory	.46	
Maintain data base	.44	
Deliver work		
Process records		
Write original material		.70
Telecommunicate		
Provide admin. support		
Provide photocopies		
Eigenvalue	2.36	1.03
Variance explained	40.9%	17.9

NOTE: Two significant factors resulted from varimax orthogonal rotation of initial solution, of which six factors were significant (had an eigenvalue greater than 1.00). First principal component of first solution explained 18.6% of the variance; cumulative explained variance of the initial six factors was 57.9%. Only loadings greater than .40 are reported.

Table 7.4 shows almost no structure to the service components. The primary factor (comprising 40.9% of the variance) is a rather passive, warehousing sort of WP use: storage and reduction of repetitive typing of forms material. The second significant factor is a "writing" factor; the WP unit is actively involved in the creation of text. We might consider these two functions as standard WP activities, except that none other than boilerplating is done regularly by at least 50% of the organizations. However, the most common functions are performed by so many organizations that they would likely be distributed across several factors.

Table 7.5 shows some reasonable structure to the role/structure components. The first factor (representing 28.9% of the variance) indicates that early planning and assessment activities were likely performed together. However this planning approach seems negatively associated with later changes due to work unit evaluations. Early planning is external to the WP unit and organized from above; internal changes perhaps do not follow easily in such a structured environment. The second factor represents just such change: A variety of WP unit evaluations occur together, and they tend to lead to changes. The third factor is the general identification of WP in our sample: centers, with WP "operators" or "technical specialists," which established formal procedures for client

TABLE 7.5 Factor Solution of WP Role Structure Components

	FACTORS					
Role/Structure	*1*	*2*	*3*	*4*	*5*	*6*
WP Unit			.81			
Operators			.53			
In charge			.72			
Rationale				.68		
Idea source					.59	
Lease-buy	.81					
Cost-benefit	.57					
Workflow	.68					
Employee attitudes	.63					
Amount of contact						.52
Procedural formality						.40
Chargeback						
Line/Page/Doc./Count		.44				
Turnaround time		.72				
Client satisfaction		.68				
Errors		.56				
Lead to changes		.54				
Others share WP place					.52	
WP personnel one place				.76		
Changes						
Supervisor			.72			
Top Management					.57	
Clients						.63
DP						
Eigenvalues	3.86	2.38	1.84	1.43	1.33	1.06
Variance explained	28.9%	17.9	13.8	10.7	10.0	8.0

NOTE: Six significant factors resulted from varimax orthogonal rotation of initial solution, of which eight factors were significant (had an eigenvalue greater than 1.00). First principal component of first solution explained 18.4% of the variance; cumulative explained variance of the initial eight factors was 71.5%. Only loadings greater than .40 are reported.

contact, but which also took employee attitudes into account when initiating WP. This approach represents a structured attitude toward WP that takes into account its group members. The flip side of this is factor 4: WP members located in the same place but motivated by the initial rationale of reducing repetitive typing. Factor 5 is a standard component: initiation of WP by top management, which continues to be involved in change, and indeed change follows from unit evaluation. The last significant factor is the "client" factor: Clients are involved in changes, and have much contact with operators, but all this contact is regulated by formal procedures. In other words, managerial control directs and facilitates communication and change.

The analyses so far have attempted to detect a standard form of WP and measures of the extent to which it is reinvented. The frequency analyses did not indicate much differentiation in this regard, and the factor structures were not particularly clear or strong, though they did indicate how some components seem to appear together. The lack of strong structure of WP components is mirrored by a cluster analysis of the service components. The SAS version of average link hierarchical cluster analysis did not find any clusters according to its cubic clustering criterion. This result indicates even more forcefully that the components seem to be rather loosely associated.

One implication is that we would not expect to be able to predict the simplest measure of reinvention—the total number of components adopted. Using the same total number of service components (maximum: 16), except coding the value as missing if an organization did not respond to more than two of the service component questions (so as to avoid a bias toward low totals due to pervasive nonresponse by an organization), the total was regressed on variables measuring structure and change. These variables were number of employees, public or private organization, amount of operator contact with clients, executive involvement in change, WP unit a center or distributed, supervisor's involvement in change, influence on change of evaluating WP, and presence of formal procedures for dealing with clients.[2] (The total N after listwise deletion was 107; total $R^2 = .186$; $F = 3.22$; $p < .05$.) Only increased operator contact with authors has a significant coefficient (R^2 increment = .137; $F = 14.46$; $P < .001$).

Of course we cannot impute causality from this analysis. More services available might draw the interest of authors; on the other hand, more communication with authors might generate requests and ideas for new applications and functions. In general, though, the total number of innovation components seems to be only a generalized indicator of reinvention, and does not seem to be very predictable, although communication plays a role. One implication of these analyses is that "word processing" is a flexible notion comprising a diverse set of services and roles. Thus, managers can take advantage of this flexibility by reinventing WP to support their organization's goals and to restructure work in positive ways.

From this implication, we now suggest that there may be a more fruitful way to look at reinvention in the adoption of word processing.

FROM TYPEWRITER TO INTEGRATED OFFICE SYSTEMS: FOUR SYSTEMS AS LEVELS OF REINVENTION

If there is one common thread to the office automation literature, at least from those who think deeply about the form and implications of new office media, it is that, as the introductory story suggests, narrow concepts of productivity and technology will stifle the potential for innovative ways to use the media and ways to work. Several typologies have been suggested that trace the progression from manual office work, an

assembly-line manufacturing model for work, to mechanization, automation, and integration. These typologies involve concepts such as "contagion" through the organization, "maturity" of the uses of the technology, "transformations" of work, and "fifth-generation" computer-based systems (Emery, 1982; Giuliano, 1982; Landau, 1983; McFarlan and McKenney, 1983: 38; Meyer, 1983a; Strassman, 1980; Tapscott, 1982; Zisman, 1978).

Even the most sophisticated technology may be used simply to increase efficiency, and as we have noted, that is the most common initial rationale. But good management of and innovation in information work can lead to increased effectiveness, successful accomplishment of organizational mission, and perhaps even redefinitions of that mission.

We suggest here that the information system—involving work, technology, and people—may take four forms. Each system exhibits increasing amounts of reinvention. Increased reinvention breaks out of prior constraints on the technology configuration, on how work is done, on what work is done, and how the sociotechnical system is designed. We consider each of the four systems in light of examples from our site visits.

Low-Integration Systems: Word Processing as Typewriter

This system operates at a level below standard adoption. Basic functions such as boilerplating, global searching, computation, linear graphics, and simple records processing functions are seldom used because their utility is not appreciated. Word processing is seen as a fancy typewriter; even routine work has not been automated.

A critical factor seems to be that low-integration systems lack WP management. From a communication perspective, there is little interaction or sharing of ideas about applications. None of these systems has a supervisor or coordinator of WP services. Further, these tend to be federal sites, largely due to the low job classifications of WP operators in government jobs. One government analyst summarized the findings of a study of federal WP usage: (a) WP increases the unit cost of producing documents; (b) the majority of procurement is for the typing function; (c) there is no training, and people have no conception of how word processing differs from typing; (d) WP is not considered as a general purpose machine; and (e) no one ever evaluates what they do with or for WP.

Many low-integration systems use the ability of the equipment to clock its use for acquisition and evaluation purposes; more advanced systems have the attitude that "anyone can write a program to keep the equipment constantly in use; keyboarding time is no measure of utility." Because of minimal management and little understanding of the capabilities of the technology, all of the sites where the unit's operation was described as "poor" (7%) were low-integration systems.

In brief, at low-integration sites, managers paid little attention to WP capability. Sometimes equipment served no purpose other than as a status symbol. A few people taught themselves to use it; some developed brilliant applications, but without systematic attention to how or to what purpose the equipment should be used, innovative practices seldom spread.

Standard Adopter Systems: Clockwork Systems

Clockworks are mechanical systems known for efficient operation of specific tasks in a stable environment. Standard adopter systems are "successful" but have not moved beyond efficiency, and will likely have little impact on whatever office automation developments occur in their organization. Communication does involve feedback to the operators, but the system does not stimulate using this communication for devising new procedures or sharing insights.

Most of these systems are centers, and all have a supervisor, manager, or coordinator. The goal of these systems is to routinize operations and to save keystrokes. Boilerplating, limited math applications, searching and replacing, and records processing are fairly common services. As one supervisor put it, "My job is to see that this office operates as efficiently as possible. The measures of this would be low turnaround time, reduction of secretarial turnover, and high quality work."

In one of the larger sites we visited, an operator told of how authors used to be allowed in the center. One day an author saw her using the global replace function and asked if she could do a special kind of revision that required rather complex searching. She thought a bit and showed him how she would do it. The author then asked the supervisor for that to be done for some special report he was preparing; he complained that the supervisor had told him it was impossible. After the author left, the supervisor told the operator that she was not to tell authors what the word processor could do. Soon after that, the center adopted a policy preventing authors from entering the center.

The paradoxical result of this emphasis on efficiency in doing the obvious tasks is that clockwork systems typically are reluctant to get new equipment, or to take the time to develop new procedures systematically; both would hamper their efficiency, even if they might do better in the long run. Short-term efficiency prevents long-term reinvention.

Again, we see a problem of attention. Attention is focused on efficient use—getting the most pages of output for the least input of human and machine resources. No one asks if the output serves any useful purpose for the organization. No one asks what they might be doing more productively with the equipment. The appreciation of "what we are doing here" is limited.

Expanding Systems: Supervisory Reinvention

These systems are characterized by supervisors who span their unit's boundaries and motivate reinvention. Applications evolve, equipment is changed frequently for new functions and applications, and the unit's mission is often to provide service to professionals. However, the motivation for change is located in the supervisor, who therefore must rely on political savvy and top management support.

Supervisors in these sites did not emphasize efficiency; instead, they told of changes and improvements. They invest in reinvention, even when it means taking longer. The WP center of a large manufacturing firm got new equipment and is diversifying its services. Using math and automated function keys, the unit has figured out a procedure for automatically updating the catalogue of several thousand products and sending material with typesetting codes directly to the printer. Moreover, the supervisor, after watching departments getting their own equipment and struggling to make minimal use of it, is setting up satellite centers to better meet the needs of departments by being closer to them. She is also starting consulting to people who get their own equipment, seeing this consulting as her future: She's launching "an educational campaign for in-house consulting."

However, supervisors in these systems recognize the tensions that arise from demands for these new services, and work to protect their operators, by managing their unit's boundaries. This involves negotiating formal procedures with clients, as we have seen, and maintaining top-level support for new equipment and the flexibility to suggest new procedures for other departments whose work they process. One particularly difficult boundary to manage is between WP and data communications/processing. Typically, the first substantive human communication between these two starts when one party wants to start communicating between equipment. WP supervisors must then secure cooperation from data services personnel who often show little respect for word processing operations or needs. (See Meyer, [1968] and Zisman, [1978] for a discussion of this particular boundary problem.)

Most reinvention-related communication in these systems is motivated by the supervisors; typically the operators are brought into the change process very little, although the managerial style of the supervisor often motivates sharing of ideas within the unit itself. One reason supervisors are so important is the rapid upward mobility of upper management. The manager who brought in WP may be gone before the technology proves itself. This transience puts a premium on fast early results, but often at the cost of support for explicit goals or specific commitments later. Thus, the supervisor must take charge. In addition, a superior's favorable attitude toward innovation has a significant influence on subordinates' attitudes toward communication technology (Elizur and Guttman, 1976).

Supervisory attention is focused on the customer or author in expanding systems. Performance is monitored by how well the system serves the customer rather than how many pages it produces. By attending to service needed, expanding systems find new uses and procedures for the technology.

High-Integration Systems: Systemwide Reinvention

Reinvention in these systems is a way of life. One subject commented, "We are definitely a service, not a center." Word processing is managed rather than supervised, and increased capability is the primary focus; in particular, augmentation of professional work is a clear goal. With this perspective comes higher risk, more operational uncertainty, and an emphasis on organizationwide communication networks.

The form and function of the work group as well as the equipment are appropriate targets for reinvention. Idea sharing leads to idea development, and then to system development, not in the narrow sense of hardware/software use, but in the broader sense of people working with technology to accomplish a mission. Interaction is the route to innovation as this manager of a work group suggests.

> We also do a lot of proposals. I said to myself, "What would I do if I had a lot of home computers and wanted to do a proposal?" I worked out a concept. I shared the idea with other people. They had an idea of where we could get the computer.

An operator put it this way,

> I always find easier ways of doing my work. With a system this complex, there are lots of ways. We are always telling each other to come over the see a new technique we have figured out. If it is something that has to be standard, we take a vote and the majority rules.

Another said,

> All our fooling around with the equipment has been most useful to us. We have learned a lot about how to do things more quickly, shortcut the machines, do more with fewer entries. To learn charting and graphics you really have to play with the machines quite a bit.

Notice that this kind of activity assumes that there is time to experiment, to learn; that communication and sharing of ideas is encouraged; and that reinvention is tested, implemented, and diffused. Supervisors and operators need to cooperate to help the user participate in system development and operation. But this does not always happen. According to 56% of the operators, tasks in their organization could be done better with WP that are now done other ways. However, only 8% are given much time to find new ways; another 44% do receive some time. Forty-seven percent receive encouragement to experiment; 24% are discouraged from doing so. Only 16% often receive praise for developing new methods from their supervisors, though another 23% do sometimes.

An example underscores the wider implications of such change. In one unit of a loan authorization agency, the process of approving loans was cumbersome and especially used professional time doing essentially clerical tasks. The people in WP found a way of simplifying the process and relieving the loan authorizers of needless copying of information by hand.

> At that time, we saw we were typing up loan authorizations and forms by hand when we already had the information stored. Someone suggested to do all of them at the same time. We worked out a procedure, sold it to management. Now the whole information process here is different. The operators who had the idea were upgraded to GS5s because they were making decisions and not just routine typing.

Attention in high-integration systems is on "our work." In high-integration systems there is less emphasis on the technology per se. As one manager put it, "We didn't set out to put in word processing, we set out to get our work done." The attention is on "good work" rather than "good use of tool." The means of doing the work is intensive communication and an appreciation of what the tools (WP) can do.

COMMUNICATION AND REINVENTION

In an attempt to understand the relationship of communication to reinvention in WP in a more quantitative fashion, we analyzed the operator data with a specific focus on the variables discussed so far. We can provide only an overview of that analysis. The primary measure of reinvention was the question "Do you and your co-workers develop new procedures for using word processing?"

Traditional sets of variables did not much predict reinvention. These include technological characteristics (machine reliability, ease of use, and versality), personality traits (play computer games, seek new ways to do things, enjoy being a leader, prefer to communicate directly with authors, have friends elsewhere in the organizations), organizational orientation (talk about organization's or group's product), or participation in certain kinds of decision making (equipment, maintenance, or personnel performance evaluation criteria).

However, the factors that do associate with operator reinvention closely parallel principles of sociotechnical systems analysis (Bostrum and Heinen, 1977a,b; Cummings, 1978; Emery, 1982): training, encouragement of experimentation, communication, and participation in other kinds of decision making (unit productivity, formatting procedures, training). In a well-designed sociotechnical system, there is an emphasis on increasing the "response repetoire" of employees. The emphasis is on increasing the competence of people to do their job, rather than on learning skills per se. For example, the two training questions that relate to reinvention are not

questions such as "Did you learn how to operate the machine?" but rather ask whether training increased their ability to make decisions.

A colleague of ours, Cline (1983), subjected 15 communication items, six job satisfaction items, and 13 reinvention items from the operators' data set to principal components factor analysis with varimax rotation. Factors with an eigenvalue greater than 1.00, and items with a loading greater than .60 on one factor and less than .40 on any other factor, were selected.

Three communication factors emerged. The factors were interpreted as "Input into Decisions," "Received Praise," and "Supervisor Friendliness", and accounted for 91% of the common variance. The two reinvention factors that emerged were interpreted as "Discussing New Procedures" and "Shown New Procedures," explaining 72% of the common variance. One "Discontentment" factor emerged from the job satisfaction items.

The correlation between the communication and reinvention sets, when considered as unidimensional (ignoring factor structures), was .51. Other factor-factor correlations appear in Table 6.

Generally, quality of communication and level of reinventiveness in word processing installations were significantly associated. The highest correlation occurred between the frequency with which operators received praise from others and the frequency of discussions of new procedures. The next highest correlation occurred between the degree of friendliness of the supervisor and an attention variable—the frequency with which operators were shown new procedures. Job discontentment is associated with low levels of both communication and reinvention.

SUMMARY

Our conclusions from this analysis of the adoption and reinvention of word processing considerably reinforce the findings of other researchers of new office media. In addition, we emphasize the role of attention and

TABLE 7.6 Correlations Among Communication, Reinvention and Job Satisfaction Factors

	Input into Decisions	*Received Praise*	*Supervisor Friendliness*	*Discontentment*
Discuss New Procedures	.32	.57	.19	n.s.
Shown New Procedures	n.s.	.27	.47	-.40
Discontentment	n.s.	-.25	-.25	

SOURCE: Cline, 1983.
NOTE: Minimum N = 160. Correlations significant at $p < .001$.

organizational communication in fostering reinvention and, by imputation, attaining the potential of the office of the future.

Clearly, planning and implementation must fit with—indeed, are products of—the particular organization culture and context. Part of this fit includes the negotiation of boundaries and the development of organizational networks, with support from opinion leaders, and from personnel in classifying jobs. Often this process includes technology plans that match business needs, or experimental and exemplary demonstrations.

But to tap the full potential of these technologies and the work groups requires wider managerial perspectives and more concentrated attention than we typically encountered in our study. As Curley (1981: 342) concluded from her analysis,

> There is no evidence to suggest that evolution towards more successful implementation occurs in the absence of a specific strategy to increase managerial effectiveness. . . . it seems to require the active intervention of management who view the technology as a catalyst for a variety of job and organizational changes which ultimately bring about the more widespread productivity gains promised by office automation technology.

Attention may take the form of training, time to experiment, and verbal praise. Successful managers tend to stress development of the new abstract and cognitive skills needed for information work instead of a constrained view of the technology.

Underlying these activities is a managerial philosophy that focuses on long-term organizational goals rather than narrow visions of efficiency and productivity. This requires support for co-worker interaction, controlled interaction with authors, and diffusion of new ways of using WP functions and doing work. Peters points out that studies of the sources of innovation emphasize that "the great majority of the ideas for new products come from users" (1983b: 17). The implication is that those close to the technology and the work process should have a major role in work procedures and products. WP units may provide an organizational model for self-designing work groups: "The essential problem in self-design is to make a teacher out of a learner" (Weick, 1977). Such groups represent a return to symmetric dependencies in the organization rather than authoritarian and hierarchical ones (Emery, 1982), and generate responsibility, commitment, and ownership—key factors in innovation (Peters, 1983a,b).

The ultimate implication is that organizational structures and work forms must be, and will be, changed: Information technology becomes a cause of and tool for organizational redesign (Keen, 1981; Zuboff, 1982). As Emery perceives these changes, "the knowledge revolution may be in the release of human capabilities rather than in microprocessors, optic fibers and satellites" (1982: 1108).

NOTES

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1. There are serious policy issues associated with the introduction of information systems, such as job fragmentation and deskilling, health hazards, exploitation of women workers, and unemployment. These topics are outside the scope of this chapter, but are discussed elsewhere (Downing, 1980; Glenn and Feldberg, 1977; Gregory and Nussbaum, 1982; Harkness, 1978; Johnson and Rice, 1984; Scott, 1982; Smith, 1984; Taylor, 1980; Zimmerman, 1982).

2. The first two independent variables were entered jointly first, to control for possible effects due to the form and sector of the organization. Number of months since implementation seems a likely control variable as well, in the sense that organizations with greater experience with WP might have more software/hardware functions or have had opportunity to develop more services. However, there were too many nonresponses to that question; it reduced the effective analysis sample size to 63. Analysis of residuals found only two cases greater than 2.05 standard deviations from the standardized mean of zero, which is to be expected at the .05 level of significance, and at the .01 level for a two-tailed test.