1983

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ABSTRACT

This case study reports observations on the work patterns of eighteen administrative managers and professionals as they use and anticipate using computer-based function at the San Jose Research Laboratory. The purpose of this research is to understand what it is that these people do in carrying out their roles, and based on that understanding, to interpret requirements for office tools. Data was gathered through structured interviews based on use of the Critical Success Factor method and the Office Analysis Methodology. General requirements are described responding to the observed variety and diversity of tasks within jobs: 1) reliable system operation, 2) stable frame of reference, 3) invisible placement of function, 4) locating data stored in diverse sources, 5) flexible access to various services, 6) support for rapid scanning, 7) "minding and reminding," and 8) stringing together diverse functions.

INTRODUCTION

Much has appeared in print lately about the "office of the future." Often this writing is based on an extension of the ideas and stereotypes which are used to talk about the office of today. In order to appreciate the nature of office work and thereby to support office workers of both today and the future, the MIT Center for Information Systems Research (CISR) and the IBM San Jose Research Laboratory (SJRL) established a joint research project. The purpose of this research is to understand what it is that office workers at all levels do in carrying out their roles and, based on that understanding, interpret requirements for tools used by administrative managers and professionals. Our approach is to interview office workers to elicit the missions, procedures, and tasks carried out in offices.

The first part of this research (Bullen, Bennett, and Carlson, 1982)

ACKNOWLEDGMENT

Practical management research in a field setting can not be accomplished without the willingness of people to participate in our studies. We therefore wish to acknowledge the cooperation and support of the managers and secretarial staff of the IBM San Jose Research Laboratory. In addition, Dr. Eric Carlson has continued to support our work with enthusiasm. His ideas, encouragement, and support are reflected in our work.

developed a view of the secretarial and support functions provided at one research site by interviewing a sample of the personnel. Two major outcomes of that research are:

1) Traditional stereotypes place artificial bounds on secretarial work. By "stereotypes" we mean the commonly held beliefs about the central practices in a secretarial (or managerial) job. We observe that secretaries can accomplish "non-clerical" results when provided with appropriate tools to facilitate their work. Indeed, advanced technology can have a "leveling" effect in that professional and managerial staff may find it cost effective (in terms of elapsed time and perceived quality of the result) to do some "clerical" tasks if they are given efficient tools.

2) Specific workstation requirements were identified for

   - a large-screen word-processor with local storage (programmable so that functions can be tailored to user needs),
   - attachment to host and network services (for high quality printed output and for user communication with remote locations),
   - typewriter emulation (for handling one-time paper forms from outside the office),
   - task switching among parallel activities, and
   - support programs and aids in the workstation (e.g., for training).

The requirements led to the development of a prototype system which is currently being tested.

In this paper we present the results of the second phase of the research project. We continued the investigation of office work at the San Jose Research Laboratory by taking a sample from the administrative professional and the administrative managerial hierarchy.

BACKGROUND

Previous research which bears on the issues of interest to us here comes from three separate areas of study: work of general managers (what it means to manage), computer-based information systems (what function should be provided), and human factors (how function should be organized to make it convenient and easy to use).

The nature of office work has been examined primarily at the managerial level. The analysis of the various roles managers fill (Mintzberg, 1975) is particularly useful when looking at their information needs and communication patterns. Kotter's (1982) agenda-setting approach helps to focus on how managers organize and dispatch their tasks and responsibilities. Rockart's Critical Success Factor technique (1979) addresses the key issues for success in the role of an individual within the organization, and the resulting analysis helps to reveal the valuable tasks in a manager's job. These approaches can assist us in understanding the work of an individual manager.

All of these studies of how people carry out work make assumptions about the important issue of managerial productivity. Most early attempts to measure results focused on the classical techniques of finding and counting tangible output results and then comparing them to an input measure, usually hours or percentage of total work time. Since the tangible measures of productivity (things that can be

weighed and counted) do not correlate well with peer or management judgments of productivity, traditional attempts to measure managerial productivity have not been very plausible. Analyzing the percentages of time (see Poppel, 1982, for a recent example of this approach) spent in various activities (e.g., telephoning, information retrieval) fails to develop a sense of how activities are connected and directed toward a result. Unless the contribution of the tasks to the overall job mission is established, it is difficult to relate the value to productivity. For example, knowing that managers spend 60% of their time communicating via the telephone does not help one to understand if and how the time spent on that task should be changed.

Although many of these approaches have been used to gain a better understanding of the individual manager, few have looked at the enterprise as a system of personal interactions required for mutually-agreed commitment to results. Flores and colleagues (e.g., Flores and Ludlow, 1980) are developing ideas from modern philosophy and modern linguistics into a taxonomy for understanding how results are achieved in office work. Managerial activities are analyzed within a framework of "conversations for action." Distinctions among "declarations, requests, promises, and assertions" are used to establish, track, and acknowledge completion of office projects. This frame of reference can have increasing impact as a way of interpreting how activities are connected to results. Office systems can then be designed as tools to aid people in establishing the "conditions for satisfaction" needed for results.

An office system is, in most people's view, an information system (I/S). For that reason, traditional I/S analysis tools have been applied to determine what computer-based functions should be included in office systems. For all the same reasons that I/S approaches fail to really get at the information needs of managers (Rockart, 1979), the same approaches fail to provide an adequate understanding of office system requirements (Sirbu, et. al, 1981).

Shaping the user's interface to technology in order to meet the needs of office workers is a third problem. Human factors (ergonomics) work typically focuses on the physical aspects of the person-machine relationship (see Ramsey and Grimes, 1983, for a comprehensive critical review of human factors literature). Our interest is in the case of use of function (Bennett, 1983), which is typically much more dependent on the software support. We are beginning to see research particularly addressed to the human factors of office work (e.g., Cole, 1982; Coulouris, 1982), but so far this tends to address current, routine tasks.

In our research we develop a methodology to better understand the nature of office work, implications for computer-based function, and the human factors requirements. We apply that methodology to several sites, and report here on the results and implications of our findings at one site.

METHOD

We built upon and applied a methodology derived from the combination of the Critical Success Factor (CSF) technique and the Office Analysis Methodology (OAM). Details on these methods can be found in the source documents by Bullen and Rockart (1981) and Sirvu, et. al (1981).

The Critical Success Factor method was developed as a way for an interviewer

to communicate with a manager about the nature of the managerial job. We used it to help us focus on those tasks and activities which lead to successful results contributing to the mission of the office.

The original focus in the Office Analysis Methodology was on identifying and building technology to support future office systems. OAM fits together well with CSF because of its top-down, mission-oriented approach to studying the office. We used OAM for revealing the detailed information needed to understand the full scope of the procedures and tasks carried out in an office.

The general flow of the interview is described in Figure 1. Higher-Level managers were queried about the mission of their function, its goals and objectives, their critical success factors, and the major tasks and procedures they perform in support of these. Front-Line managers answered questions confirming the mission of the function and their critical success factors. We then asked people in this second group to focus on the procedures and tasks that predominate in their work and provide detailed information on these. Documentation for the methodologies describes the kinds of questions asked. The purpose of this paper is to report on the results of

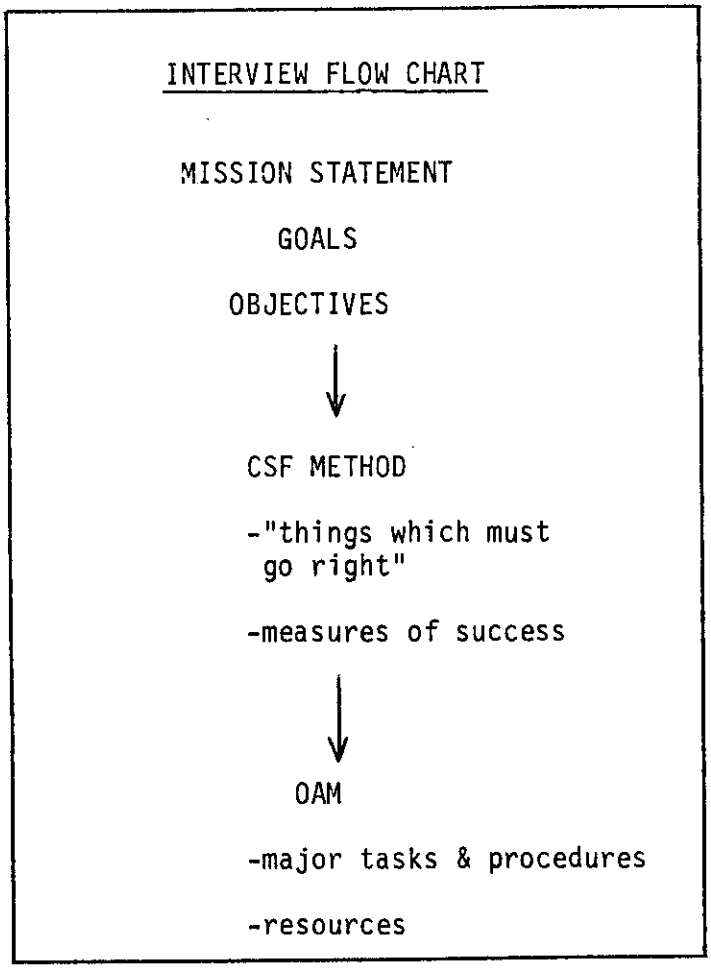

Figure 1. Flow of the Interviews

using the methodologies, not on the methodologies per se.

SAMPLE AND SITE CHARACTERISTICS

The IBM Research Laboratory at San Jose was the main study site for the part of the study described here. The administrative staff at the SJRL supports the research areas of Computer Science, Physical Science, Storage Systems, and Applied Science. All centralized administrative tasks are combined at a functional level known as Administrative and Technical Services which reports to the Laboratory Director. The 18 interviews sampled the administrative staff which, including secretaries, contains about 90 people. A schematic organization chart, listing the number of people interviewed in each area, is given in Figure 2.

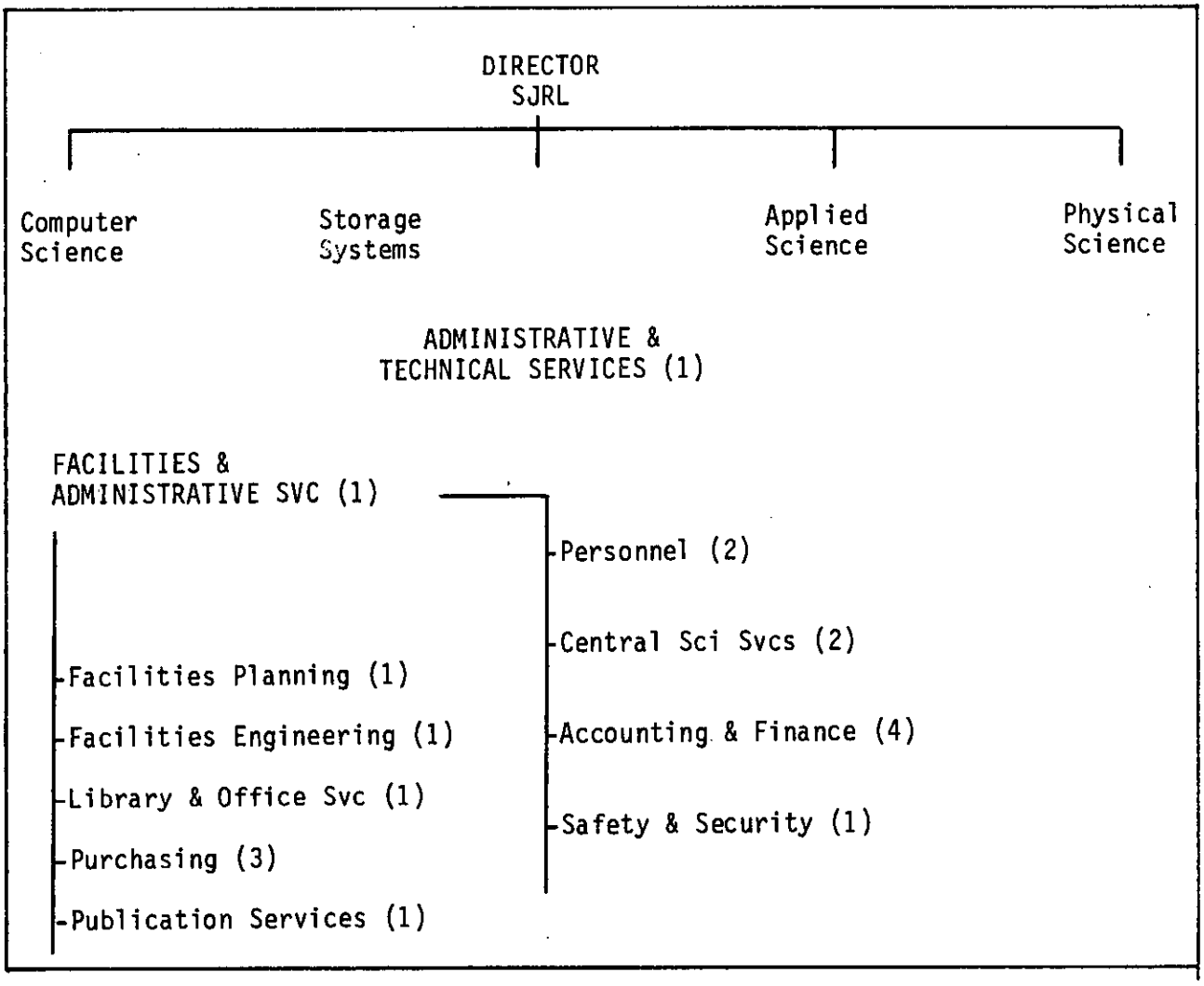

Figure 2. Schematic outline of administrative services at the San Jose Research Laboratory. Each of these units is headed by a manager. The number in each category represents the number of people interviewed (including the manager).

The staff accessed computer function through desk-top cathode ray tube (CRT) terminals with monochrome display of 24 lines of 80 upper- and lower-case characters. The CRT terminals were attached to a large-scale host computer operating the VM/CMS system. Attached to the system, directly and through a network, were a variety of printing devices for production of paper output. The network also linked computers in most IBM laboratories worldwide. People in the study used a large number of macro programs for full-screen editing, document formatting and printing, and for communication both locally and remotely over the network. An important feature of the environment was that people share example templates for producing documents, news about macros, and useful procedures for getting results in each user's personal workstyle (Bullen, Bennett, Carlson, 1982).

Earlier research has described the ways in which an individual manager's job varies (Mintzberg, 1975). Our observation from initial case studies suggested that it is valuable to categorize managers into groups on the basis of preliminary observations about the organization. We prepared to interview formats:

- Higher-Level managers -- ten of our participants had either the formal positions of managers of managers or equivalent responsibilities.

- Front-Line managers -- five were people who have non-manager staff people reporting to them. In addition three administrators with "manager-like" responsibilities were included (e.g., purchasing agents).

The interviews of Higher-Level managers followed closely the outline in Figure 1. The interviews of Front-Line managers differed somewhat in that we obtained more detail about the major procedures which characterized each job in this level.

INTERVIEW RESULTS AND DISCUSSION

The interviews and site observations, interpreted within a direct research" paradigm (Mintzberg, 1979), led to the following results. The differences in the work of the two groups of managers appear important in understanding the characteristics of the office work and the specific office system requirements for each.

Higher-Level Managers

The jobs are characterized by variety and diversity, are communications-intensive, consist primarily of semi- and unstructured tasks, focus on exception-handling, and are strongly interrupt-driven. For these reasons, it was easier for these participants to describe generic activities rather than to outline specific tasks and procedures.

The predominant activity they perform is exception handling. When either the stated policies and procedures fail to cover a task, or the subordinate level of management asks for help, tasks come to managers at this level.

We found that Higher-Level managers spend from 35% to 80% of their time communicating: in meetings, in one-on-one conversations, and on the telephone. Three quarters of these managers spend over 50% of their time in such activities. Text composition, which for these administrative managers is primarily memo and letter writing, accounted for 5% to 30% of their time, with one third of the sample averaging over 20% of their time in this activity. In this group, 5% to 10% of the managers' time is taken up in working with forms. Since our sample is composed of managers in administrative positions, this percen-

tage may be high in comparison with a general manager. The final two categories are mail processing, (2% to 20%) and other tasks (such as budgeting, calendar management, copying, travel, and professional affiliation work) generally taking less than 5% of their time.

Front-Line Managers

These people are usually focused on a single or small number of procedures; the procedures can be characterized as consisting of structured and semi-structured tasks. They interpret established policies and procedures, and the procedures generally consist of recurring and repetitive actions.

We deduced that the Front-Line managers spend from 10% to 50% of their time communicating. However, where in the case of the Higher-Level managers, "communication" took several forms, in this group communication was almost entirely via the telephone. The actual percentages are closely associated with function: highest in purchasing and lowest in accounting and finance. Text composition for this group is primarily the production of reports, with the highest percentages (30% to 50%) found in accounting and finance. Since we are studying administrative professionals, it is not surprising to find that they spend from 25% to 40% of their time in forms-related activity; in one case we estimated that for one person in accounting the figure is 70%. Some of the forms are automated, while others are the usual paper versions. The other major activity of the Front-Line managers is database inquiry. The range here is 15% to 40%. Interestingly, for these managers, inquiry into either online or traditional paper files is a major activity and one that was not reported by the Higher-Level managers. One possible explanation for this is that Higher-Level managers carry out "database" inquiry as part of their communication activities: they ask others who know or who know how to get the information.

Recognizing the differences in the work that the two categories of managers perform will help designers to build the specific system needed in each situation. However, the fact that we are dealing with managers, implies that the two groups have many commonalities as well. While systems exist that meet some of these requirements, our interviews suggest the need to meet all the requirements in a single system. The following observations come out of our interviews.

Requirements for Both Groups

1. Reliable system operation.

Effective managers and administrators often have a personal commitment to the delivery of work results on time. When a computer "lets them down," the fact that this condition is beyond their control does not mollify them. For example, when our managers used a text processing tool, designed to be highly-tuned and appropriate for their needs, to compose online a carefully worded response in a sensitive situation and then discovered loss of the creative work due to computer failure, they were extremely upset. The level of personal commitment of these managers to creative results can be contrasted with reactions of some support personnel when unavailable service forces a welcome "extra break."

We have observed that communication activities are of prime importance to managers. If message/mail systems are to be accepted and incorporated into work patterns, they must become as reliable as the telephone. The exchange of a personal telephone message leaves both parties with a sense of completion. Playing "telephone tag" through a message center is currently unsatisfying. The value of asynchro-

nous computer messages have been noted in many places (e.g., Crawford, 1982). To give a sense of closure which is equivalent to that of the person-to-person telephone call, the sender must be able to find out if (and when) a message was received and, if necessary, to inquire about progress of the message toward the destination.

2. Stable frame of reference.

A stable frame of reference is required (Bennett, 1983) within which the user will rapidly recall how to access function in the same way that the skills needed for riding a bicycle or driving a car are remembered and transferred to a different model of vehicle. In the case of this study, we are speaking of users' cognitive memory, the mental models that support manager recall of successful use patterns. This is especially important for people with jobs requiring access to a diversity of function. For example, the manager of the "model shop" needed to gather information from his own historic files, vendor information from purchasing files, and accounting data from financial files. The manager needing rapid, efficient use of seldom-used functions must rely on easily-recalled standard modes for interaction: for example, when a Higher-Level manager must fill in for a Front-Line manager who is out. In contrast, the software architecture to support clerical work is easier to design, as that kind of office work tends to be intensive, repetitive, and buffered from interruptions.

Lest too much be made of the differences between managerial and clerical support requirements, we recognize that the secretary may have to use the manager's applications to accomplish some result in the manager's absence, and the manager must be able to access clerical functions in an off-hour emergency. The support for this kind of teamwork is related to the breaking down of stereotypes we have noted above. Thus, the bounds established between functions need to be attuned to policy and contemporary practice rather than frozen inflexibly into the system.

3. Invisible placement of function.

Another aspect of flexible access to function is observed when we consider where the function is located within the computer system. The computer scientist observes important distinctions when implementing function in stand-alone terminals, distributing function through local area networks, or providing functions as part of host services. Other distinctions arise in the difference between storing data locally and distributing data in a network. We need to think now about how to make some of these implementation design decisions invisible to the manager's process of use. Managers as users expect to see differences only in the cost of the service and the response time, not in the way they must interact with the system while doing their job. Indeed, most of our interviewees referred to all information systems as "the system;" they did not distinguish among purchasing, personnel, and accounting. Services must be in a form they can relate to without obvious and intrusive intervention needed from intermediaries.

4. Search for data stored in diverse sources.

The information gathering needed to handle exceptions on an interrupt basis requires the manager to be able to "go where the data are" regardless of historical Data Processing and Word Processing distinctions. The integration of office systems with traditional information databases is becoming increasingly important. Office workers need access to a variety of data in a diversity of locations. Because artificial boundaries are tradi-

cause artificial boundaries are traditionally placed around the service purveyors, this will be a formidable technological and political task. (See McKenney and McFarlan (1982) for a good review of this phenomenon.) The managers we interviewed assumed the future ability to search for what they needed anywhere in "the system."

5. Flexible access to various services.

The need for flexibility is observed especially in the area of communication. Because not everyone will be online and not all person-to-person exchanges are appropriate for the computer medium, the manager requires links to the customary mail system, to the telephone for both direct interaction and voice messaging, to information supporting face-to-face meetings, and to their audio and video counterparts.

6. Support for rapid scanning.

In the process of finding needed facts, managers are accustomed to paging through masses of data as they look for the information buried in a flood of text and figures. Formats appearing on printed forms (one page memos, forms, tabular data) serve as aids to rapid scanning. In addition to fast display response time for interactive user requests (taken for granted here as an obvious requirement), the data returned must be displayed in a spatial relationship familiar to the user and appropriate to the characteristics of the display device. For example, the representation of a form can give the user a familiar place to look for a category of information. Editors which allow for context search of a string of characters can assist scanning in a similar way when a particular text pattern is sought.

7. "Finding" and "Reminding."

Malone's work (1983) in investigating how people organize their desks is of interest here. He points out that there are two important functions reflected in the piles of documents in someone's office: a finding function and a reminding function. While our two groups of managers need both functions, the different natures of their jobs suggest that the reminding function may be more significant in the unstructured, diverse jobs of the Higher-Level managers. The Front-Line people need a more intensive finding function to locate supporting data on their desks, since they are processing documents according to a standard set of rules and procedures.

As tasks in both areas become automated, an electronic method (serving the same function as piles on desks) must be developed. The finding function can be enhanced by the computer's capability to "file" a document under many subjects, thereby increasing the odds that a manager will remember at least one way to retrieve it. The reminding function can be initiated by automatic reminder messages scheduled to appear at future times and dates.

A Requirement of Special Importance to Higher-Level Managers

The key to successful movement of the current structured functions found on computers into the interrupt-driven, unstructured world of the Higher-Level manager (Poppel, 1982) will be found when designers learn how to support the manager who needs to string together parts to develop a whole result.

8. String together diverse functions.

A diversity of function is beginning to become available. Unfortunately, the incorporation of this function into the manager's style of use is not

easy. Often the "process of use" currently requires knowledge of esoteric, computer-oriented facts -- especially when something goes wrong. What is needed in a "user interface architecture" is attention to supporting standard patterns of use valid in a variety of applications. Examples of processes that can be meaningfully standardized are the way a user edits text (Meyrowitz and van Dam, 1982), finds data, moves content from one representation to another, and requests help in operating the system (Sondheimer and Relles, 1982). Often the output from one task becomes the input for the next. A task not completed as a result of a priority interruption leaves a thread which must be remembered, found, and picked up later.

Figure 3 summarizes the set of requirements we have observed for this part of the study. It is interesting to compare the results here with the set of requirements observed earlier (Bullen, Bennett, and Carlson, 1982). The previous study tended to focus on physical requirements. In the current study, we see more emphasis on the logical requirements, the shaping of the functions (typically through software) presented at the workstations. It is interesting to note that the requirements in both studies apply to managers and secretaries. We use a graphic representation to indicate the degree of importance (as judged from our interviews) for each group.

IMPLICATIONS

Because we used CSF to focus on aspects of their jobs critical to success of the function, our findings point to the valuable activities these managers perform. Therefore, developing systems to support these activities should have top priority. In addition, the distinctions between the work of Higher-Level managers and that of Front-Line managers is useful in understanding the specific combination of requirements to be supported.

The implication of office systems to support these managers has implications in terms of individual productivity and organizational impacts.

Productivity

The underlying concern in studies of office system implementations is productivity. If the organization did not view the introduction of computer-based office tools as a way to increase the productivity of those working in the office and thereby enhance organizational performance, no office system would be implemented.

The measure of productivity, however, is a difficult task. For example, in the case of the Purchasing Department personnel, the mission is not to process purchase orders, but to provide a service to the SJFL that is viewed as responsive and cost effective. Customer satisfaction -- receipt of the correct product (in a reasonable amount of time and at a competitive cost) -- is a better measure of service than a simple count of number of purchase orders processed in a week. Having the service requested, procured, delivered, and evaluated online could be a major advance. For example, we observed that members of the professional staff used the online message system to verify routine or expedited delivery.

Another example given to us by a Higher-Level manager in the Personnel Department is that his productivity is not simply measured on the number of qualified candidates who get interviewed. In addition, he is measured on his ability to interact with the technical managers in the SJRL, understand the educational needs of their departments, and to design and execute programs that fill these needs.

	HIGHER-LEVEL	FRONT-LINE	SECRETARIES
MANAGERIAL USERS			
Reliable System Operation	●	●	●[1]
Stable Frame of Reference	●	o[1]	o[1]
Invisible Placement of Function	●	●[2]	●[2]
Search for Data in Diverse Sources	●	o[2]	⊖[2]
Flexible Access to Various Services	●	o[2]	o[2]
Support for Rapid Scanning	●	●	●
"Finding"	⊖	●	o
"Reminding"	●	⊖	o
String Together Diverse Function	⊖	o	●
SECRETARIAL USERS			
Large/Full Screen w/Local Intelligence	⊖	⊖	●
Networked Workstation	●	●	●
Typewriter Emulation[3]	o	o	●
Task Switching for Parallel Activities	●	o	●
Local Support/Aids for Training	⊖	⊖	●

[1] use system more frequently

[2] repetitive tasks

[3] onetime forms

● critical

⊖ moderate

o desireable

Figure 3. Summary of Requirements

There are two ways of having a constructive impact on individual productivity:

1. facilitating structured procedures which may not be critical, but which are easily automated (e.g., text processing); and

2. facilitating valuable, mission-accomplishing procedures.

We identified structured procedures that benefit from technological support, and in some instances, automation has already been achieved. For example, the personnel interviewed in the Purchasing Department make extensive use of a small group of telephone numbers to reach the vendors they call most frequently. As a result a good business case was made for automatic dialing enhancement for their telephones. They are pleased with that feature and use it extensively. However in the area of tracking purchase orders after they have been initiated, they follow a cumbersome procedure in which they must get information from more than one computer system. While there are historical reasons for the two systems, it is clear from our research that better support could be provided for this task. Another example comes from the Accounting and Finance department where much of the processing of travel reports is done manually. Relatively simple automation support could improve processing time and the timeliness of the budget expense information available to management.

To the extent that the diverse jobs of the Higher-Level managers contain structured aspects, office systems can be designed to relieve them of mundane procedures. Examples are aids for access to reference material (reminder files, telephone listings, message logs), and support for scanning personnel data and forms. Using our methodology, it is relatively straightforward to identify these areas where, because of the structured and recurring nature of the task, it would be beneficial to automate the process.

CSF helped us to identify the valuable, mission-accomplishing procedures and tasks. For example, communication activities were always reported as important tasks. The use of the internal mail/messaging capability at San Jose was growing at a fast rate. At the time we were conducting these interviews, all but two of the people we talked with were using terminals or had them on their desks and were waiting for connection. They were all using or planning to use the message system. It was seen as an important way to save time lost in missed telephone connections and in unnecessary face-to-face conversations. The importance of mail/messaging systems in managerial communication is being widely studied and observed (see, for example: Crawford, 1982; Hiltz and Turoff, 1978). The messaging system at the SJRL plays a central role in introducing managers to the communication aspects of office systems and in encouraging the managers' interest and use of the system.

Other tasks viewed in this category had a similar theme of saving managerial time. For example, managers in Personnel had begun to use the computer system to keep notes from meetings so that producing a final written document could be done online from the notes. In fact, one reached over to his terminal and made some notes during our conversation.

A second major category in this area is general managerial support. The managers as a group saw the computer as an aid supporting their personal workstyles by providing quick reference to lists, reminder files, budget information, and written documents. Because of the variety and diversity across managers, and even for the work

of a given manager on a given day, access to a broad range of tools is valuable. Kotter's work (1982) focuses on this aspect of the job: "The managers do not function in a crisply defined environment or direct through formally delimited channels ...;" rather, "they must find ... what to do despite great uncertainty, great diversity, and an enormous quantity of potentially relevant information." Designing an office system to support this aspect of managerial work is the challenge and is where the significant payoffs lie.

Organizational Impacts

Clearly there will be direct organizational impacts from automating, changing, or supporting the kinds of tasks we identified. Automating some of the structured procedures will entail changing processes which have been in effect for years. People will have to learn new ways of doing old things, and some current tasks will become unnecessary. Resistance can be expected to these changes from those who interpret almost all change as negative. However, some changes will have positive benefit. For example, the message system can lead to the end of "telephone tag." In another case, while facilities planners will have to learn new ways of "drawing" to use automated systems, this new tool can help in office layouts and in the monitoring of space and planning. As a net benefit, it should significantly decrease the amount of time they report spending in the clerical task of representing their ideas on paper. It will also allow for rapid exchange of ideas and actual plans with facilities people in other geographic locations. The ultimate effects of all this increased support for communication is difficult to predict, but there is no doubt that there will be effects on the organization.

COMPARISONS WITH OTHER CISR STUDY SITES

In general, the observations at SJRL are consistent with observations at other sites where this office systems research is being carried out.

At a large aerospace corporation the contracting office was studied in depth. The same patterns of variety and diversity appear at upper levels of management. The need for office systems which address structured, repetitive tasks exists for Front-Line managers. In addition the importance of the information retrieval function in the managerial support component is particularly significant at this site, and this underlines the need for integration of office and information systems.

At a major eastern manufacturing corporation, the use of a variant of this methodology is leading toward a strategic office system plan. In this case the method has been valuable in helping to factor stereotypical beliefs from actual system requirements. The population being studied there is not limited to administrative managers but rather includes all managers in an operating division. The methodology also helped an internal task force to better understand the company-specific aspects of the office work. This understanding is providing valuable insight into general office information needs. As a result, two pilot studies are being planned which could lead to an integrated office information system providing both office systems support and links into the traditional information databases of the organization.

Two general observations come out of work at the five sites where we have actively used this methodology. These are supported by informal reports from 20 others.

1) Our studies reveal important insights which can be generalized across organizations and aspects of each organization which are specific to that organization. An understanding of both is necessary in planning support systems for the office.

2) "Office systems" analysis uncovers a need for a managerial support system that includes information ordinarily provided by the information systems department. This makes intuitive sense since we consider office systems to be a piece of the information systems puzzle. However, as the I/S function evolves (Rockart and Treacy, 1981) to a managerial support function, the integration of office systems with more traditional information systems becomes increasingly important.

SUMMARY

The topics we have covered in this case study of administrative managers include managerial work, technology, and human factors. It took the data processing practitioners and researchers many years to recognize that successful design and implementation of new technologies requires attention to this range of issues. This lack of recognition led to major failures (not formally reported in the literature for obvious reasons) in the implementation of information systems. We are hopeful that these disciplines can be integrated and that we can therefore be better equipped to plan, design, implement, and maintain ongoing support for future office systems.

In our opinion the goal in office systems design is to incorporate three critical aspects:

- an open attitude toward the nature of work in offices;

- a sensitivity to the environment within the organization, the style of the individual person, and the interactions which take place; and

- a thorough understanding of the productive outcomes of office work.

We suspect our research observations are not limited in application to the work of administrative managers. We feel that what we have seen will hold true in our continuing research, where the methodology is being applied to the study of line managers and at other corporate sites.

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