
How Do 'Real' Managers Use Office Systems?

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THE PARABLE OF THE ADJUSTABLE WRENCH

A CEO was making a morning plant tour and observed for the first time, a maintenance worker using a new tool. This tool, an adjustable wrench, had many advantages. It was compact and made it unnecessary to carry a large number of fixed-end wrenches. After talking with the worker, the executive determined that the new tool was as promising as it looked. The CEO immediately cut short the tour and issued an organization-wide memo which mandated the purchase of adjustable wrenches for every employee.

Following this ultimatum, all personnel spent great effort attempting to use the new tool. Every morning, employees could be seen coming to work and trying to use the adjustable wrench; secretaries opened their desks and executives opened their briefcases to remove their personal adjustable wrenches. They then spent the rest of the day contemplating how to use this new productivity tool.

INTRODUCTION

In recent years, questions of information technology's (IT) benefits have raised issues like those in the adjustable wrench story [2]. In the parable, a tool that improved the productivity of one class of workers was mandated for use by everyone. The result was a productivity *loss* for workers who struggled to find uses for a tool that was poorly suited to their work.

Information technology has spread widely onto the desks of professionals and executives. Reports conflict over the productivity gains of IT users; some depictions are positive while others have had difficulty fitting computers to managerial and professional work. To what extent are these tools suited to the jobs of white collar workers? If the fit is good, the opportunities for performance improvement make IT indispensable. But if the fit is poor, the result will be dissension and a general dissatisfaction with information systems.

Both information system managers and users need to know IT's benefits and limits [1]. But hard data about managerial use of IT systems are severely limited. The purpose of this study was to reduce those unknowns.

PREVIOUS WORK

In a previous study, Kublanow, Durand, and Floyd [8] found that managerial use of information technology is driven by IT's perceived utility for assigned tasks. These results were

substantiated by Collopy [3]. An analysis of interviews and system use data substantiated the link between work benefits and computer use. Kublanow, Durand and Floyd distinguished between "core work" and "support-work." Core work consisted of directly assigned work responsibilities; those responsibilities that were reflected in performance reviews (e.g., meeting budget). Support-work was the series of tasks which were necessary but not sufficient by themselves to result in positive performance ratings (e.g., scheduling meetings, writing memos).

Core work is the more important component of managerial work. Support-work, although not primary, is still a necessary part of the workday. But support-work is not enough to result in successful completion of assigned responsibilities. A major finding of the study was that managers used a computer system primarily because it provided perceived value (performed core or support-work). This "work-use" relationship was present regardless of the user's age, sex, or organizational level.

Studies of work patterns reveal that managerial work is fragmented, high pressured, and interpersonal [10, 7, 9]. Such work patterns rely heavily upon time management and communications to coordinate, inform, and make decisions [9]. As a result, we expected to find significant communication and time-based uses of computing systems among upper managers.

The strength of the computer lies in addressing repetitive,

clearly defined problems. By contrast, a manager's job is fragmented, open-ended, and filled with non-routine problems [7]. The open-ended nature of upper-level managerial work raises questions about the fit of current computing technology to the fundamental requirements of managerial work.

Thus, the work-use link became the focus of a second study reported below [12]. It asked two important questions: 1) what are the system-use patterns of managers and business professionals, and 2) *how* do office systems "fit" the work of managers and business professionals?

THE STUDY

Using a combination of personal interviewing and system logs, we studied 111 persons from a headquarters group of a *Fortune* 50 company. The participants — 11 executives, 56 managers, and 44 business professionals — represented a cross-section of the organization's units. Representatives from finance, accounting, information systems, logistics, and planning participated.

Procedure

The study had three parts: 1) initial interview, 2) automatic electronic logging of system use, and 3) follow-up interview. The initial interview used a structured format with open-end and scaled items. It recorded the manager's work responsibilities and perceptions about the systems' contribution to work accomplishment.

The second phase of the study used automatic logging software (developed by the organization's information system personnel) to record participants' system entries (including the duration of every session). Automatic logs were kept from July through early October. The participants' computer use was logged an average of 42 consecutive calendar days; however, an average of 19 work days (or more than three, five-day work weeks) were actually recorded. The unrecorded days represented weekends, holidays, vacations, business trips, etc.

Records were maintained for every computer application showing use that exceeded one minute during the entire study. All log recording occurred with full knowledge and consent of the participants. Each participant was assured that individual results would be confidential. It is possible that the participants' knowledge that logging was occurring could have influenced the results. However, this was unlikely since logging occurred across weeks of normal work; the starting date was not explicitly known (only an approximate study start date was revealed); and the software was totally transparent to the user (no extra commands or system "behaviors" were required or apparent).

In Phase Three, every subject was interviewed to obtain

a detailed explanation of *how* each recorded application had been used on the job. We probed for specific examples of how the system supported assigned work. Also, participants gave each recorded command a rating of its core work content.

Logging Analysis

The 284 different applications accessed during the study were classified into 10 functional categories (Table 1).

Table 1
Command Category Descriptions

Function	Description
Communication (COMM)	Outgoing electronic mail
Data Analysis (DATA)	Analysis of stored and manipulated data
Documents (DOC)	Preparation of lengthy documents and reports
File Management (FILE)	Maintenance and organization of files
Graphics (GRAF)	Preparation of graphics presentations
Electronic Mail (MAIL)	Incoming electronic mail
Reference (REF)	Look up names, addresses and telephone numbers of organizational members
System (SYS)	Utilities to receive help, to maintain and to connect to other mainframes and systems
Time Management (TIME)	Electronic calendar, reminder and to-do list
User Commands (USER)	Programs and commands originated by the user and not part of the system tool library

Additionally, system use was classified into four time segments: 1) total available time (total time a person had access to the host computer), 2) connect time (total time that a user was "on the system"), 3) session time (total duration of any particular command or application), and 4) core time (the portion of command or application use devoted to accomplishing central work activities). Core time was calculated by multiplying "session time" by each individual's "core work" rating. Content analysis of the interview data established the work context of computer use. Subsequently, these 10 categories were collapsed into four groups comprising time, communications, data, and other (see Table 2).

Table 2
Final System Use Categories

System Use	Description
1. Communications	electronic mail notes and messages using "look-up directories"
2. Time Management	electronic calendar electronic reminders personal schedules
3. Data	text editing search and retrieval data analysis and graphics
4. Other	user created applications system operation ("housekeeping") commands

FINDINGS

General Findings

The logging software revealed the *actual* use of office systems by executives, managers, and business professionals. Figure 1 summarizes the system use findings. That figure

compares system use patterns on four broad groups: time, communications, data and other.

By comparing the three types of users (executives, managers, business professionals) and interesting finding emerged. Only professionals made significant use of the total system. As Figure 1 shows, the profile of business professionals revealed significant system use in *every* application grouping. The managers' and the executives' system use was much more focused. Executives spent more than half their time on time management applications, while managers emphasized communications.

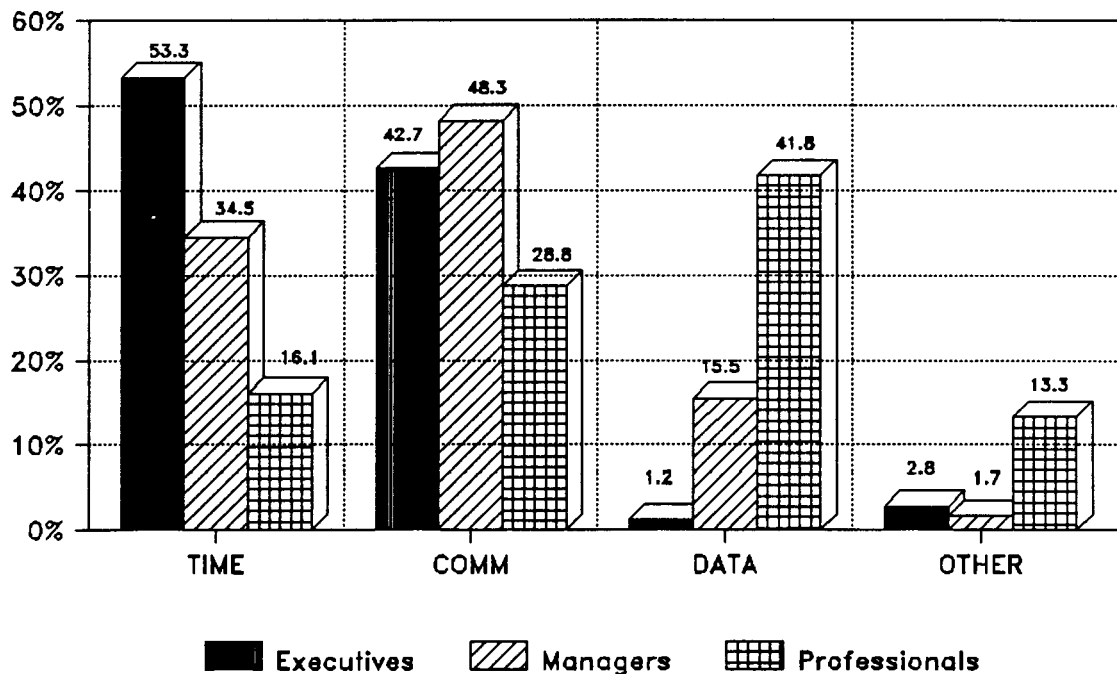
Executives

Experts recognize the value of an executive's time; this was reflected in an emphasis on time-related computer applications. Furthermore, the value of executive time justified a high level of professional and secretarial support which curtailed the personal need to enter data into the system. Communication made up 42.7 percent of the executive's system use. Interestingly, little DATA or OTHER system use was recorded for executives.

Managers

Managers were responsible for translating the directions received from executives into action at lower organizational

Figure 1
System Use by Job Position
(minutes/day)



levels; this resulted in an emphasis on communications. As with executives, COMM applications were a major proportion of total usage (48.3 percent). Additionally, keeping up with meetings, schedules, and subordinates' activities encouraged use of the system's time function (TIME was 34.5 percent of their system usage). Some use of data-related functions came from those managers who lacked professional or secretarial support or who preferred to enter and analyze data themselves. DATA applications were 15.5 percent of managers' system use.

Business Professionals

Business professionals were responsible for producing data analyses and reports to support the work of managers and executives. Their system use reflected this responsibility; professionals were heavy DATA users (41.8 percent of their system use). Further, the communication functions helped

transmit the information to upper organizational levels (COMM made up 28.8 percent of their use). Finally, secretarial support was lowest among business professionals, so the system served a variety of support-work activities (TIME was 16.1 percent and OTHER system use made up the remaining 13.3 percent).

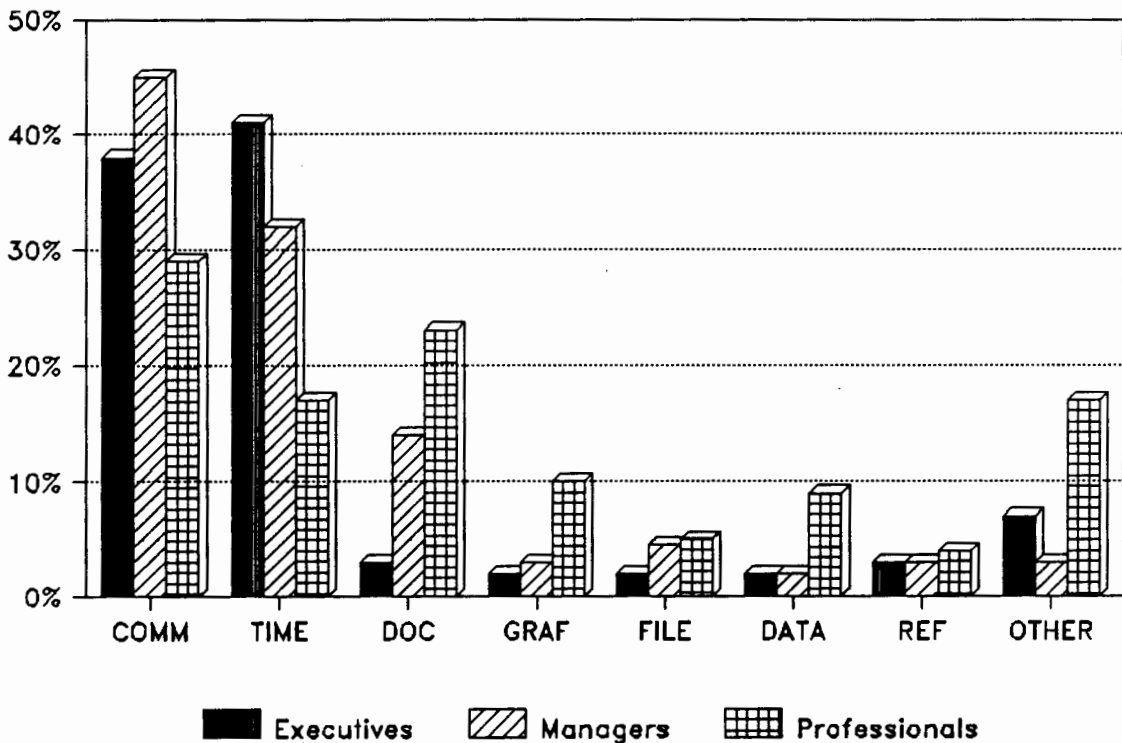
The overall computer use patters from Figure 1 revealed that participants (executives, managers, business professionals) adopted IT applications which supported their respective work.

DETAILED FINDINGS

Function analyses

Each system function was measured; Figure 2 shows the average use of various system functions. Expanded descriptions of these findings follow:

Figure 2
System Activity per Function



Communication

The advantages of electronic communication over alternative channels include: 1) the speed of response, 2) the avoidance of "telephone tag," 3) the special use of long distance transmission, and 4) the self-documenting nature of electronic notes and messages.

Comparisons of outgoing with incoming communication flows revealed different core work rankings. Participants gave higher core values to outgoing communication (which they initiated) than they gave to incoming communications (which others initiated). Such views are consistent with attribution theory which values "own" efforts and intentions as greater than efforts of "others." The outbound communication fits the description of managers as the "people in the middle" who are responsible for translating the decisions of executives into action by subordinates.

Communicating is an activity that occupies much of an executive's or a manager's day; the use of electronic communication constituted the greatest system use among these two groups taken collectively. It is not true of executives alone. Interestingly, the business professionals' use of outbound communication was primarily lateral (with peers).

Reducing "telephone tag" is supported by these quotes:

- A) "Now I can get to people I couldn't reach before. It cuts 'telephone tag.' I can send a note to six people; in the old days, I had to call six people — what a dreaded thought."
- B) "The benefit is you can make progress on projects without talking to people, and there is no question about what's said because of documentation."
- C) "On short items, I used to walk down the hall ... invariably I spent more time talking about other less important subjects ... this is a real time savings for me."

IT increased the pace of communication up and down the whole organization. The ease of sending and receiving communications reduced the time needed for response to "buck slips," information requests, "to do" lists, etc.

Such increased speed created a new discipline for communication:

- A) "We are dealing with the time value of information here ... it's that things don't get put on the bottom of the pile. I see that something gets done because it stares me in the face."
- B) "I get a request (from an executive) that used to take 14 days. Now it takes two to three days to get down through the levels."

Importantly, clarity and timeliness enhanced the communication process:

- A) "It forces me to think out my idea more carefully. Now we need to be crisp in our requests and responses."
- B) "... helps to keep subordinates informed; it might lead to better morale and teamwork."
- C) "Sometimes people may not even pick up the phone when they are in their office, but an electronic message gets through."

Concerns regarding electronic communication included:

- A) "You can rely on the system instead of facing a problem (a good 'out')."
- B) "I get things in the electronic mail I don't need because people can send me stuff just by pushing a button."

Time

Time is both a personal and a corporate resource. The purpose of time management is to better allocate this resource. Information technology assists three time management phases: 1) planning (create "to do" list), 2) implementation (schedule appointments), and 3) control (document activity for report purposes). Since time management focused both on "doing the right things" (effectiveness), as well as avoiding waster time by "doing things right" (efficiency), the computer applications contributed to core work.

The "TIME" function consisted mainly of the electronic calendar. Every subject used it. For executives, it was the single greatest category of office system use. For managers, it was the second most frequently used function; the third most used among business professionals.

The ease of updating electronic calendars encouraged changes in schedules. Accurate calendars were a resource for reviewing past activity and for coordinating work. An unexpected finding was that *subordinates* often followed the calendar of their superiors to anticipate changes, future requests, and other "happenings" which might affect their work. As one person said, "You can learn a lot by watching your boss's calendar."

Time savings from using the system came from reductions in time needed to arrange meetings. Some supporting quotes:

- A) "Scheduling meetings with managers the old way: running from secretary to secretary ... the new way: instant arrangement. It saves times and frustration."
- B) "Instead of walking over to my boss's office to check his calendar (when I want to see him), I now do it electronically."

The quality (effectiveness) improvement from the coordination made possible by IT provided an important justification for using electronic calendars.

- A) "... more likely to schedule a meeting once and have it come off on time."
- B) "People make meetings on a more timely basis. They can't say 'it wasn't on my calendar.' My secretary and I are 'in sync.'"

Reference

The reference function consisted of an electronic version of a phone directory. Managers and business professionals used the function 1) to find phone numbers and 2) to find electronic or mailing addresses, 3) to search for contacts (without a particular individual in mind), and 4) to check the spelling, initials or titles of persons for correspondence. Such an application may appear to be trivial or of low value, but in a very large organization the practical aspects of locating the desired person for mail or phone correspondence makes an electronic phone directory an up-to-date source of important information. Used in this way, "REF" became an adjunct to the communication process.

Users reported that the reference function was two-to-six-times faster than conventional directories:

- A) "In the old method, (you would) look up the site, call the information operator and check to see if the number was accurate. With the new method, you only need one command per call."
- B) "In the past, I sometimes didn't bother to call because of all the pain associated with getting the phone number."

Besides the time savings, participants found positive impacts on the communication process itself:

- A) "It helps me decide where someone is located and that lets me know whether I want to call them. I'm in personnel, and it's necessary to know what function or division they're in."

Document Preparation

The document function was used to create formal or lengthy document. This contrasted with the more informal notes sent by electronic mail. Both business professionals and managers used this system function — executives rarely did. Persons using the function prepared 1) routine memoranda, 2) formal correspondence, 3) longer reports.

Since there were several ways for users to communicate, it was not clear what criteria they used to choose among media. Often it appeared that the participants judged that

electronic options were superior to telephone conversation and paper correspondence.

Sizable time savings were reported from IT use:

- A) "If I write long hand, I have to rewrite it for my secretary to be able to read it. I can type much faster on the system than I can write it long hand."
- B) "It reduced to zero the amount of typing given to the secretary."

Besides speeding up the document preparation process (efficiency), many users believed that documents created on the system were superior to those produced by traditional means. For persons with keyboard skills who understood the system, the ease of document revision encouraged refinement that often resulted in higher quality work products. This was supported by subsequent research [5]. Also, moving from draft to final copy in a single session avoided distractions that come with delay and involvement of another person — the secretary — in the creative process:

- A) "Now I can make some changes, and the secretary won't even necessarily know. I don't feel I'm imposing on her ... I get a better product."
- B) "I can interact while composing, and this improves the presentation of thoughts rather than drafting it and seeing it two days later (after the document returns from the typing pool)."

File

The file category was used less than many of the other functions. Business professionals were the greatest users, but even among them, its use only averaged four minutes per day. It was used to retrieve longer documents. Also, the file function permitted maintenance of the users' personal disk space by periodically purging unneeded files. Because of the "housekeeping" nature of the file's use, it received a low core work rating when used only for that purpose. By contrast, its use for retrieval of longer, more non-routine documents (e.g., special reports) may have accounted for the users' average core work rating of 65.9 percent.

Interestingly, even within the file function, communications played a predominant role in IT use. Participants used the file function to receive non e-mail documents and to prepare lengthy reports for others — both fundamentally communication activities.

Graph

The GRAPH function provided a method to communicate in picture form, but its use was severely limited. Business professionals were the predominant users — only trivial

executive use of the graph function was recorded. Managers also evidenced a low use rate. Managers and business professionals appreciated the increased quality output afforded them through graphics. As one person said, "... it's almost impossible to do the same thing (graph) by hand."

The quality improvement in graphic presentations was considered as "great." One manager said, "The transparencies are so slick, you can sell them!"

Less supportive was the view that many graphic presentations were competitive and overly elaborate: "We don't have a star wars here; but we do have transparency wars."

Data

The data function included a variety of analytical tools. Surprisingly, only the business professionals made more than trivial use of these applications. As one manager said, "I don't know anybody (manager or executive) who sits around 'DSSing.'"

In our study, the primary use of the mainframe system for data analysis concentrated on planning — "what if" analysis, mostly.

Statistical Analysis Systems (SAS) and APL Data Interface (APLDI) were the packages used to calculate and manipulate numerical data. VM Information Center functions (ADRS), e.g., editor, was used to produce reports. Structured Query Language (SQL) was used to produce data base reports.

The business professional's job involved analysis, presentation and reporting to a supervisor for managerial use. Thus, the data function was very important to professionals, both for quality enhancement and for time savings:

A) "In a 'what if' analysis for budgeting, I generated four spreadsheets for an upcoming decision. It's impressive to be able to look at a complicated problem several ways in two-day's time."

B) "It used to take two days to do a 'what if' case ... now it takes two and one-half hours."

Improvements occurred in decision support timeliness and creditability: "I built a model for a new product announcement's effect on used equipment pricing. Before, you did this once and stuck with the answer ... you had to live with the outdated model."

But, not all business professionals reported IT quality contributions. Several persons described practical and psychological benefits that were unrelated to performance quality.

A) "I do the same thing ('what ifs') many more times, but we still aren't any closer. I used to have time to develop only three scenarios for a forecast.. Now I can generate 30 or 60 of them — and I'm *still* off four percent."

B) "If I'm wrong, the number of iterations is a good defense. If I'm right, nobody knows how many times I've done it."

CONCLUSIONS

Importantly, many IT applications supported core work. We observed applications and benefits that extended into basic managerial and professional work. These argued that office systems support important core work for all three studied groups — executives, managers, and business professionals. We received frequent comments that quality (effectiveness) was one of the major benefits of information technology.

Our study also revealed a wide diversity of core applications. This was especially apparent among executives and managers, pointing out a need to transfer applications among users. The potential for transfer is enhanced by the finding that many of the applications were communications oriented.

Luthans, et al. [9], presented data showing that managers spend 29 percent of their time in routine communication (e.g., timely paperwork, routine exchange of information); they devote an additional 19 percent to networking (e.g., socializing, interacting with outsiders, politicking). These findings increase the expectation that managers would use IT's communication capabilities fully. Our findings support this conclusion. System support of communications may have the greatest general impact on the productivity and quality of managerial and executive work.

Although certain "fits" occurred between IT and managerial work, some functions were absent. For example, very few executives or managers used the system for data analysis or to produce graphic presentation. Further, there was little evidence of formal computer decision support use among users. Professionals, by contrast, made extensive use of the DATA and GRAPH functions. This supports Keen's [6] "chauffeur-driven" model in which staff members perform complex analyses for managers rather than requiring interactive use. Managerial and executive core work may involve very little formal analytical activity [10, 11, 4].

Our results indicate that the potential effect of IT on productivity and work quality for executives, managers, and business professionals is far from realized. Previous implementation efforts have focused on training users in system functions and leaving application usage to the individual. Such an approach has resulted in inconsistent productivity and quality effects. Since IT use is driven primarily by work demands, rather than by variations in computer literacy, the key to leveraging office system benefits requires developing applications that support *real* work for *real* managers (especially core work). To maximize this leverage, applications discovered by one user should be transferred to others. Additionally, managers and executives need applications that stem

from careful analysis of work content and system capabilities. Carrying out this work-driven approach means training users in core work applications — not merely how to use various *existing* system functions.

Thus, our findings show that IT fits the work of executives, managers, and professionals more broadly than the adjustable wrench from the beginning parable. But there was evidence that entire categories of system applications were unused by executives and managers (e.g., data analysis). Is this lack of use a function of the technology's limitations, or is it a function of the core work content among users? The answer is crucial to those responsible for IT design and implementation.

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