

# Managing the costs of information

*Paul A. Strassmann*

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*Reprinted from*



Harvard  
Business Review

*September-October 1976*



# Harvard Business Review

September-October 1976

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## Volume 54, Number 5

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 Editorial offices, Boston, MA 02163.  
 Second-class postage paid at Boston, MA and at additional mailing offices; POSTMASTER: send form 3579 to Harvard Business Review, Boston, MA 02163.

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# Managing the costs of information

*The data manager's job  
goes far beyond the computer—  
to management of all  
its information resources*

*Paul A. Strassmann*

As organizations begin to harness the full power of information technology, the framework for analyzing information systems requires broadening. To make any sense of further computerization, all labor costs surrounding the computer—at both the input and the output end—must be accounted for. By means of nine steps toward total management of information resources for greater productivity, the author offers help to information managers seeking trade-offs among office automation, office labor, and office performance.

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*Drawing by  
Robert Pryor.*

Industries and governments all over the world are currently struggling to contain rising administrative and clerical overheads by automating information handling in the office. In the past 20 years, white-collar labor has been the fastest growing component of the work force in every industrialized country. Yet this labor segment consistently shows lower increases in productivity than such blue-collar employment sectors as farming, manufacturing, and mining, where the management of capital versus labor investments is much better understood.

If bureaucracy (in the most benign sense of the word) is indeed the premier growth industry of the foreseeable future, then the dollars spent on white-collar automation must assume prime importance, particularly for the top information-systems executive in an organization. My purpose here is to show that managing information systems now goes far beyond just managing computers and to suggest a series of steps for managing this enlarged function effectively.

Information processing in today's large, complex organization really encompasses three sectors. The first is the by now well-understood and well-defined data processing sector. Aside from the costs of computers, terminals, and peripherals, this sector includes expenses for such things as computer services, time sharing, data processing supplies, data communication, programming support, operating labor, and consulting. It has been estimated that, in 1973, organizations in the United States spent about \$26 billion in this area of information processing.

Now the problem is that all too many of today's information processing executives define their jobs

largely within the context of data processing—they focus their energies on integrating the explosive data processing technologies into their organizations. This task has not been easy, but overemphasis on it has led managers into the trap of ignoring a second major sector of information processing, which for lack of a better term I call “administrative processing”—a sector on which an estimated \$42 billion was spent in the United States in 1973.

This sector is rarely aggregated under a single expense heading, yet it accounts for the largest and most frequently used set of tools and facilities for handling information transactions. It includes everything from typewriters, word processors, and dictating equipment to telephone and Telex networks, recording devices, copiers and duplicators, facsimile-transmission devices, microfilm equipment, and even such relatively mundane necessities as office supplies, mail, and simple filing systems.

These administrative tools are quite diverse and often isolated from one another, so that the expense involved in their use tends to become highly diffused. Historically, little trade-off has been possible among such individual office “technologies.”

Indeed, only rarely is an organization dedicated to the vital task of integrating these noncomputer aspects of information handling. But it is precisely here that the fastest expense growth is occurring in today's office environment; competition across several new administrative processing technologies is already here. This means that if we are to control rising expenditures for white-collar automation, careful expense accounting for these technologies must come under the rubric of information systems management.

The third sector of expense that should fall within the purview of the modern information systems manager involves people. After all, neither data processing nor administrative processing is an end in itself. The payoff from all sorts of office devices and facilities, from computers to mail rooms, lies in increasing the productivity of office labor—secretaries and typists, switchboard operators and clerks, administrative personnel and people who process applications, claims, orders, and inquiries of all sorts—that host of office employees classified as nonmanagerial and nonprofessional.

What makes the office labor sector so important for information systems people is the fact that it is the

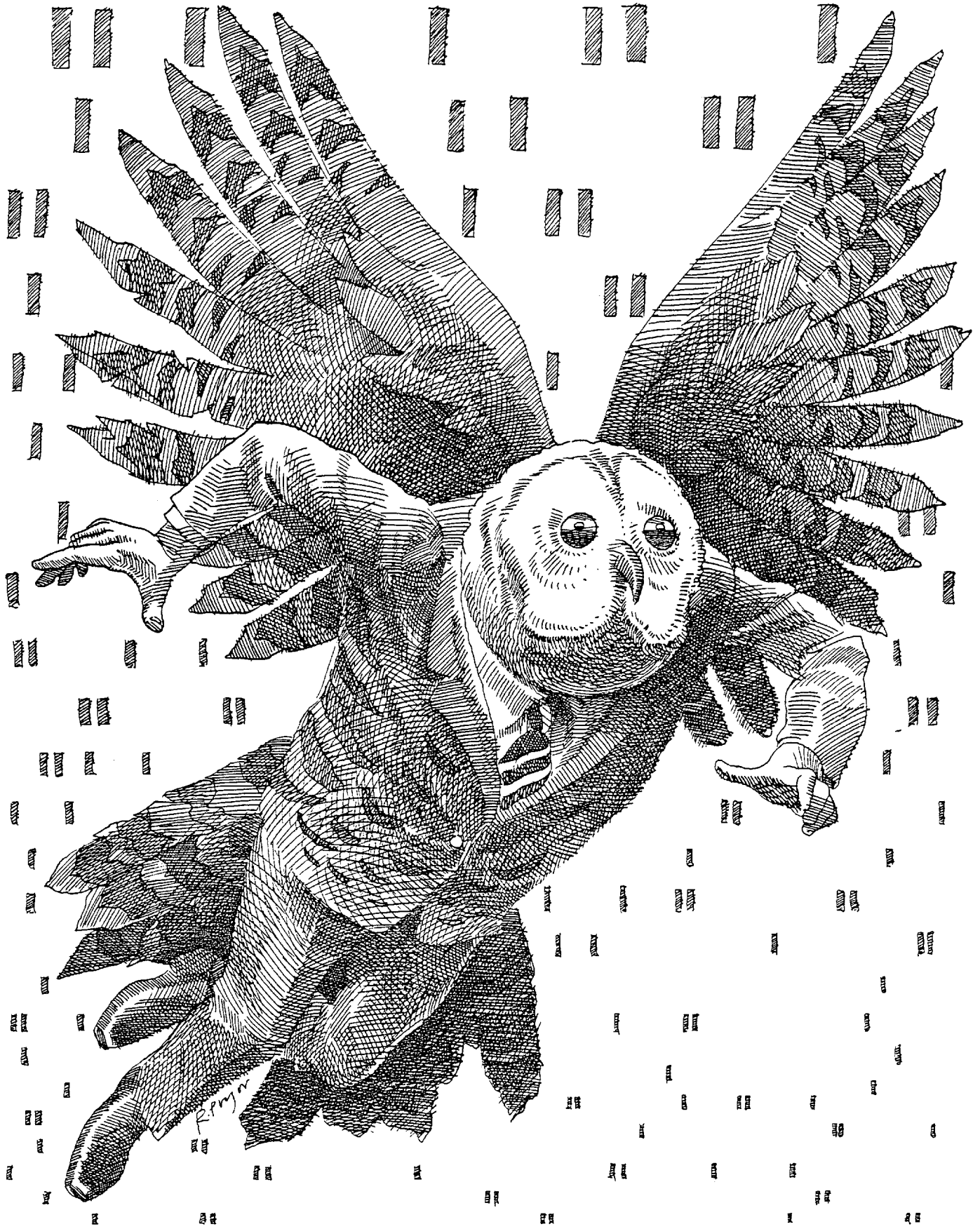
largest single occupational category—approximately 22%—in the U.S. labor force. What's more, in 1973 the total annual expense associated with such personnel, including benefits, pensions, office space, and other allocated overhead, has been estimated at about \$350 billion.

The work that these people do, while vital to our organizations, represents almost entirely an overhead burden—and a fast growing one, too. From 1950 to 1970, the proportion of employees in these “overhead” categories as a percentage of the total U.S. labor force grew by more than 6%, while those in categories representing “direct” labor in areas of high productivity (for example, farming and manufacturing) decreased their share by more than 9%. Thus office labor represents a rich source of cost saving indeed for the information systems manager. If the myriad information transactions that this huge segment of our work force performs can be systematized and made efficient through modern information-handling techniques, the financial benefits will be great.

To accomplish this, we must abandon the traditional practice of managing excessive overhead labor growth by periodic pruning. Data processing, administrative processing, and the work that office labor does have become too intertwined and interdependent for the one-shot surgical approach to work anymore. Rather, we will have to design self-adaptive cost-control methods into each organization's systems and procedures. We must learn how to install advanced office automation techniques that will safeguard productivity improvements as conditions change.

In the face of uncertainties about the future volume of information transactions, the relative importance of various cost elements, rapid changes in technology, and shifting attitudes toward office automation by labor and government, we must harness the power of information technology through a more responsive control mechanism. Let us explore briefly the objectives of such a mechanism and then move on to the action I recommend to achieve it.

Once we accept the notion that the top information executive's job encompasses much more than managing data processing expense, we still have to articulate, in terms of precise objectives, just what the job calls for in today's business environment. In my view, the new job definition would include the following objectives:



- Ensuring the integration of data processing, administrative processing, and office labor productivity programs.
- Instituting accounting, cost-control, and budgeting innovations that will subject *all* information systems overhead activities to the disciplines traditionally applied to direct labor.
- Subjecting office labor automation programs to analyses comparable to those applied to all other forms of capital investment.
- Conceiving organizational designs that will permit information to be handled as a readily accessible and easily priced commodity rather than as a bureaucratic possession.
- Creating within the organization an internal market for alternative information systems products, so that trade-off decisions, even technologically complex ones, can be decentralized into the hands of local user management.
- Fostering a technique of pricing that will allow decisions on introducing new technology, or abandoning obsolete technology, to be made on a decentralized basis.
- Installing and monitoring measurement methods that will protect improvements in productivity achieved by automation programs.

These objectives are far from easy to achieve. However, from experience with information systems in several large organizations, I have developed a set of nine guidelines, or steps, that have proved helpful in my work. They have been sufficiently tested to make me feel quite confident in offering them here as a practical route for any organization to follow in an effort to control its own information systems programs.

I should emphasize, however, that all of them may not be valid, or even acceptable, in every organization, for they do involve some major restructuring. Nor can they all be instituted quickly. Changing a whole organization's perspective on information systems management to the broader view I have set out here must be a gradual process. Thus the steps outlined in the balance of this article constitute a rough road map to guide an organization toward the total management of its information resources.

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## Managing costs

The sequence should start with the budgeting process. It must identify all of the components of information processing cost and segment them by (1) *function*, for example, the total cost of performing the billing function, from order entry until receivables are reconciled, (2) *technology*, for example, what portion of the billing cost is done clerically and what portion by computer, and (3) *organization*, for example, what the various billing systems of one organization are.

### Step 1: identify costs

Identifying computer and telecommunication costs is relatively easy. The tough part begins in identifying budget elements of corresponding administrative processing and office labor cost. Classifying expenses and people can be difficult, since organizational boundaries do not translate readily into functional or technological definitions. This step will probably require major modifications in the organization's job classification scheme, so that job categories for white-collar personnel become more detailed and comparable job functions become consistent across organizational lines.

In addition to this internally oriented, personnel cost analysis, careful attention must be paid to external purchases of services and technology. Because the budgeting process focuses on expense levels of a particular organizational element, costs incurred outside do not readily surface when an attempt is made at a functional profile of costs.

For instance, in arriving at the total cost of the billing function, you need to make sure that the costs of mail and banking services are included. The overall billing expense should include investment costs as well as new systems-programming or minicomputer-development expenses that are to be amortized over a period of years. Since for accounting purposes most information systems costs are now expensed rather than capitalized, it is important that your cost identification process discriminate between these different classes of costs.

Finally, a word of caution: step 1 is not an easy, one-shot effort. Depending on the size and complexity of the organization, it may take up to five years of

continual changes in the budgeting process before consistent data are obtained. The new cost identification scheme must become the accepted way of looking at the cost structure of *all* information activities. And this takes time.

### Step 2: keep score on unit costs

Knowing what each information transaction costs is critically important for all that is to follow. It is the only way to monitor productivity trends independent of changes in volume, work element mix, and inflation.

After wrestling for years with the problem of getting comparable data on the consequences of computer automation, I have concluded that, to really control administrative costs, one must begin by tracking "real," deflated unit costs for discrete output end products. By these, I mean items like cost per service call, cost per payment, cost per purchase order, cost per printed page, and cost per inquiry. Only by keeping score over a number of years on such consistently defined unit output measures is it possible to observe real improvements in cost performance.

In unit costing, it is important to define the measurements in sufficient detail that assigning responsibility for them at the working level is easy. Defining a measurement too broadly forces excessively high aggregations such as one finds in divisional overhead-burden ratios, where little can be done to trace the consequences of specific productivity improvement programs.

Also, be sure to include total unit costs for each unit output measure you choose. For instance, the cost of management overhead, employee benefits, and capital must flow into unit transaction costs before you can make valid comparisons between various means of improving productivity through office automation.

In describing these first two steps, I am considering information processing services as an *industrial process* rather than as an undifferentiated overhead. This is quite deliberate, for in my experience it leads to a much better understanding of how costs can be controlled in this rather amorphous and "messy" domain.

### Step 3: establish standard costing

Setting a standard cost for each element of measured information output is essential for several reasons.

First, when cost reductions are planned, they must be locked into the planning and budgeting system by means of standards against which operating management can be measured. All too often, existing charge-out or full-cost-absorption costing systems disguise cause-and-effect relationships in expensive information processing activities and make it practically impossible to look at period variances from planned expense levels in a way that keeps management accountable for results.

Second, standard costing for information services is essential for making long-term commitments to users. If they have a predictable cost picture, users can feel more confident in making new investments and in decentralizing systems investment decisions.

A third reason for standard costing is its ability to reflect variability, so that the organization supplying information services can no longer cite "fixed costs" or "undisplaceable overhead commitments" as excuses for not achieving productivity improvements.

The basic tool for achieving standard costing is a job process sheet containing the cost profile for every resource used to create an output transaction. Each job step is costed out just as if it were part of a manufacturing assembly operation. The job process sheet should focus on all pertinent costs, such as those for handling, editing, output preparation, mailing, and reproduction or storage. In this way, analysts searching for cost reductions can do a thorough evaluation of the thousands of discrete activities that make up the total information processing budget.

In a well-run operation, such improvements do not come easily; saving a penny here or a nickel there is typical of most paper-work activities. This situation means that the basic tool—the job process sheet—must be designed with sufficient detail to permit an ongoing review of operating costs for every information transaction involved.

Aside from making it easier to track operating costs and thus to highlight opportunities for savings, the most important consequence of standard costing is that it changes the attitudes of managers supplying central information services. Standard costing also tends to shift the staff and planning people to the working levels of the organization, where they are

closer to being a part of direct product cost. Also, such managers become more wary of commitments to fixed technology costs.

The reasons for both of these attitudinal changes lie in the imperatives of standard costing—that indirect overhead be kept small and that technology costs be responsive to changes in volume or to obsolescence in methods.

The experience with standard costing at Xerox has so far been good. We now operate over 40 internal information services groups that derive a large part or all of their revenues from standard revenue per unit of output. As a minimum, each of these groups must liquidate its entire cost structure, including all overheads and management charges, from a changing revenue mix. The overall result has been a sharpening of the ability of managers to respond to a changing information systems environment, while maintaining good accountability for cost performance.

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## Organizing functions

The action steps discussed so far—identifying costs, tracking unit costs, and establishing standard costs—are all procedural aspects of information systems control. To be effective, they need an organizational focus. Cost-accountability centers, in which people engaged in functional office activities are assigned to product-oriented units, will provide this.

### Step 4: set up accountability centers

The rationale for this approach stems from the recent tendency in business, industry, and government to centralize information processing functions. Centralization, so goes the argument, puts the information processing specialist under one umbrella, consolidates the technology, and concentrates expert management—all this in the guise of “economies of scale.”

But the real problem occurs after centralization takes place. Simply put, it is this: How do you manage large agglomerations of clerical and administrative people without sacrificing the attributes that make them effective in their local environments? For in-

stance, how do you justify taking personal secretaries away from individual managers and grouping them into better equipped word-processing centers without losing in motivation what you gain from computerized text-editing typewriters?

The answer seems to lie in finding an organizational compromise between centralized efficiency and decentralized effectiveness of people. At Xerox, we have achieved this middle ground by creating small teams—sometimes as few as 10 people but never more than 50 to 80—to handle well-defined information-output tasks.

For example, our manager of the payroll processing center has complete control over his product, which is payroll checks and payroll-related reports. He is, in effect, an entrepreneur in the payroll processing business. He is responsible for his cost reductions per payroll check—weighed against error rates, document turnaround time, cash management, and so on. He sees himself, in turn, as being in a highly competitive payroll business, in which he must not only optimize his total resources but also aggressively seek opportunities for providing new and better services.

More important, we encourage this manager to make trade-off decisions among a variety of resource deployment choices that are available for improving his overall financial results. Thus he may trade off such options as training investments versus salary levels, information investments versus manpower expense, teleprocessing cost versus data processing expense, and in-house service versus external procurement.

In my view, the true test of “decentralization” is not an organizational one; rather, it is whether a manager responsible for an end product has the freedom to make trade-offs like those just cited in getting the job done. In such an environment, it is then possible to charter data processing or administrative processing activities without getting bogged down in organizational definitions. Output becomes the proper focus. When information processing functions become the accountability centers, they are in effect little businesses, buying and selling goods and services as needed.

For instance, our payroll processing center (to use the same example) “buys” batch-processing and time-sharing from our “centralized” computer service units, and “sells” the reports and analyses that are by-products of its payroll work to decentralized



personnel departments within the company. Although people in computers and personnel may regard the payroll processing center as a centralized function, it operates in the independent, decentralized way I have described.

In short, one person's centralization becomes another's decentralization. The labels become meaningless after a while. In the end, it is accountability for the cost of information processed that matters.

### Step 5: apply competitive pricing

In information processing operations, it is not easy to establish standard costs and create accountability centers. There are two reasons for this: technologies can change radically, and the costs of computerization are hard to set realistically. Let me explain briefly what I mean.

When a new technology such as data base management software or time-sharing appears, the cost of converting to it, learning how to use it, and getting "customers" to employ it will make it appear non-competitive with established methods. Thus the manager of an information processing operation may be reluctant to try the new technology. In contrast, obsolescent technologies always appear more attractive in the short run, since they are well established and it does not really cost much to add to the bag of tools already being used.

Comparing the cost of computerization with the cost of the human wages that will be displaced is also a very tricky business. Manpower is always valued at the going "market" rate for salaries plus benefits, whereas the cost of computerization varies according to the company's cost-accounting practices in allocating the initial introduction cost.

The up-front cost of buying a computer is usually written off separately, with the result that the price of computer time—at "marginal cost"—is almost always substantially lower than the market price offered by commercial service bureaus. We then have the incongruous situation that, when labor and machines compete, labor savings are valued at market price, whereas computer time is costed at a heavily subsidized level. It thus becomes impossible to compare the two costs realistically.

The solution to both of these difficulties—accommodating new technology and making valid cost comparisons—is to open internal information pro-

cessing operations to competitive market forces by basing their revenues on prevailing competitive prices for equivalent services.

Establishing a market price for each information service rather than pricing it at "cost" accomplishes several ends: (1) it simplifies cost accounting by avoiding complex overhead allocations, since all automation facilities become fixed expenses if viewed from a sufficiently short-term standpoint; (2) it stimulates the introduction of new technologies because it permits cost averaging of such innovations over program life; and (3) it allows simulated "profit" objectives to be assigned to the lowest levels of an operation, so that even first- and second-level management has a clear understanding of what it can and cannot do.

An example of this last advantage is our experience with word-processing centers. When we first created them, we found it difficult to establish their scope and performance measures. Using competitive prices from local firms, we then allowed the text-preparation technicians (that is, the ex-secretaries who work in these centers) to charge their "clients" for secretarial services. The results were gratifying, because we found that, to remain competitive, we had to back off from many fancy technical solutions.

There are, however, two serious disadvantages to using market pricing formulas for internal transfer of information services. Automation opportunities may be turned down that would be justifiable under a marginal costing approach. Second, an efficient internal information processing operation may accumulate a large surplus of revenues over costs, and most bureaucracies simply do not have accounting conventions for dealing with internal profits.

The issue of too little automation can be easily resolved by regarding new automation investment opportunities as a part of the conventional capital funds budgeting process and applying the same criteria for choice used there. The recent progress in the technology of information processing suggests that there will be no dearth of automation investment opportunities over the next decade or so.

Establishing comparability between office automation and other capital investment opportunities should simplify the decisions on how to allocate scarce resources. The cutoff level between approved and disapproved automation projects will then be roughly consistent, regardless of the way investments are priced.

As for the issue of accumulated profits, each organization must resolve it within the context of its own rules. One way of looking at such profits is to use them as an indirect measure of how efficiently a particular service unit is investing in information technology over the long term. If it invests its funds wisely—in technology that makes its people really productive—the unit should not only be able to keep up with rapidly dropping market prices for information transactions (and thereby garner new customers) but also to use the accounting surpluses for making new investments (and thereby prepare for the future).

### Step 6: plan for the long term

Here I want to focus briefly on a basic dilemma facing the manager of an information systems department in a large organization. The people using the services he provides usually want some new task done right away—in three months or at most a year. The trouble is, meeting such a new demand often requires information technology or processing methods that take a long time to install.

This, plus the fact that total information processing costs can exceed 15% of a large organization's expense budget these days, is why the planning of long-term information strategies warrants the same processes as are applied to functions like marketing, manufacturing, distribution, procurement, and personnel.

In this step, therefore, I strongly recommend that information systems investment decisions be shifted from an annual funding basis to two- to five-year planning commitments initiated by the functional user departments in the organization. This suggestion means that the information systems department, even if it is completely decentralized, should not contend for corporate budget funds as an independent cost center.

Rather, its budget levels should be set through renewable long-range contracts with the *users* of its services, that is, with the people accountable for end product costs containing various elements of information transaction expense.

### Step 7: let the users control

This step is a logical outgrowth of the shift of planning initiatives regarding information systems from

the suppliers of information services to the users. Users should control not only the initial procurement but the execution as well. After all, they are the ones who understand the trade-off opportunities between information and other variables in functions as diverse as manufacturing, engineering, marketing, personnel, and procurement. Computer people and administrative specialists like to claim that they know what is best for their clients, but information systems are just too important to the success of an organization to be left entirely in the hands of the suppliers of information services.

To achieve the necessary degree of control, I recommend that key aspects of information systems management—business analysis, methods planning, and applications training—be moved organizationally as close to the ultimate user as possible. This arrangement not only enables the user to make intelligent procurement of data processing and administrative processing services but also creates a powerful mechanism for balancing the business needs of the user against the claim of the information technicians.

I am frequently asked how to structure the user's organization to accommodate the systems planning and systems implementation personnel. There are many possible organizational combinations. However, my experience leads me to favor assigning business systems analysts to the planning mission for each functional area, since these are the people who are concerned about the future or about methods for changing the operating environment.

In preparing for new ways of doing business, we must increasingly rely on information systems as a means of achieving goals. Therefore, I am convinced that the user's planning area is the logical place to put information systems development and control staffs.

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## Redirecting emphasis

Over the past few years, I have become convinced that the greatest opportunities for lasting productivity in information processing lie in job redesign and job enrichment rather than in improving the efficiency of existing data processing operations. To be sure, new computer technology and new systems approaches are frequently essential in improving the work done in offices. But there should be no mistake

about what should come first—human work needs, not technology.

### Step 8: deemphasize the technology

I am recommending here a significant deemphasis of technology in information processing operations. This reorientation means that top information executives face a new challenge. Whereas their primary skills have been focused on technical management, the enlarged scope of information processing calls for a humanistic, nontechnical, and general management perspective rarely found among more specialized executives.

How can the transition from an excessive computer orientation be engineered? Perhaps our experience at Xerox can point the way. Recently, we have begun increasing our investments in methods, procedures, and training. For years, these activities atrophied as talent moved into the more glamorous and better paying computer-related activities.

The payoff from this redirection has been gratifying. For instance, in the information network we are currently installing, analysis of methods and work flow has shown that computer terminal access to central data bases allows us to rearrange accountability for work functions. Under the old system, work had to be broken up into specialties: accounts receivable specialists handled accounts receivable; equipment order entry clerks handled customer orders; credit was still another specialty. The new approach allows us to make versatile generalists out of narrow specialists. Since our people can now see the total results, job satisfaction has increased substantially.

Such a change is not free. I estimate that the costs involved in changing procedures, redesigning jobs, and training people to do them (all of which I call the "soft software") have exceeded the technical costs for setting up the computer terminals network itself (which I call the "hard software").

The important fact, however, is that the soft software aspects of the project have been given the same care and attention as the heretofore more glamorous hard software aspects. We have begun our own campaign of deemphasizing technology by increasing the importance and influence of the people who develop the soft software.

I should point out that deemphasizing technology in information processing operations does not neces-

sarily mean getting rid of your technical people. It does mean, however, that you can shift many of them into administrative systems positions, where there is plenty of systems work to be done.

A goodly portion of the money formerly spent on computer problems can thus finance efforts to standardize technologies, to automate programming and testing tasks, to devise output measurements, and to improve quality control—all of which will increase the productivity of your technical resources. What this step comes down to, then, is a rebalancing of talent, not a purge.

### Step 9: use job enlargement

This recommendation elaborates a bit on the previous step. I single it out for emphasis because it calls for transforming our current rigidly designed information systems, with their emphasis on single-task work stations, into a different mode—one in which systems tasks are enlarged to include many of the attributes of computer-aided learning.

One of the problems I see in most existing information systems that rely mainly on computer terminals is their relatively narrow task orientation. People do not fit readily into such an environment. The training levels of individuals vary, and their attitudes toward work fluctuate. Therefore, designing terminal procedures to the lowest acceptable performance level, and leaving output volume as the only performance variable over which the operator has control, is clearly unsatisfactory, since it lessens productivity and discourages the operator.

For this reason, I recommended that terminal operating procedures be designed as a combination of tutorial and job execution devices—a combination that permits changes in both task content and job scope. As I see it, terminal systems should encourage people to deal with situations of increasing complexity as organizations and individuals continue to grow in their experiences.

As organizations perceive that increasing portions of their expense budgets are being devoted to information processing, judgments will have to be made about where to place the responsibility for overall information systems management. Making such decisions requires that both information systems executives and top management take time to reappraise their roles. To be specific:

□

Top management will have to decide whether to strengthen its control over increasing complexity and interdependence by gathering the functional costs related to information processing.

□

Explicit choices will have to be made among investments in computers, software development, training, methods development, telecommunications, job design, technologies available, and compensation levels.

□

Most important, top management will have to decide whether some of the steps presented in this article can be applied in their own organizations. Even if it is found, for example, that information processing cost-accountability centers and productivity improvement through job enlargement are desirable, will there be adequate management talent available in the existing information processing operation to support such a major change?

□

The information systems manager will also have to reappraise his role. Can he learn to delegate the management of technology to others? Can he break free of the disciplines that shaped his entire career and enter into competition with management generalists? Can he acquire the new skills needed to motivate white-collar workers toward greater involvement in their work? Can he broaden his background to include the complex economics of information handling?

There is no doubt that arriving at answers to such questions will be difficult. Initially, only a small number of organizations will find switching to information-cost management sufficiently urgent to make these issues matters of central concern. In all likelihood, they will become central in information-intensive organizations like insurance companies, banks, credit card organizations, government social service agencies, income tax departments—places where information processing is a principal occupational concern. But as the pace of technology quickens and as shrinking margins make it necessary to employ resources more economically, most large organizations will have to consider the issues of information cost management as inseparable parts of overall business planning.

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