THE FUTURE DIRECTION OF INFORMATION SERVICES TO IMPACT THE BOTTOM LINE

Paul A. Strassmann
Xerox Corporation

I will be describing lessons learned from managing the total functional cost of information processing that exceeds half a billion dollars. This article is based on the broad concept we have at Xerox that the cost of the users cannot be separated from the cost of the technology.

We have developed the concept of total "back office" management at Xerox, in the last five years. Our total cost of information processing includes in addition to EDP, telecommunications, word processing, filing, and customer inquiry handling, also the expense of over twenty-thousand people engaged in all forms of administration exclusive of its managerial and professional contents.

We believe that we ought to look functionally at the entire process of managing the information resource, because this is increasingly becoming an overriding societal concern about the growth of bureaucracy. This concern is not only unique to private industry, but also to public services where the information function accounts for almost the entirety of expenditures.

We are continually confronted with having to arrive at trade-offs between current and future investment streams, short term cost reductions, and performance improvement objectives while in the process of managing information. The margins are getting tighter and the profit squeeze is on; therefore, the information function today has to account to top management for bottom line impact to a greater extent than ever before.

We have to weigh an increasingly large number of options in making these assessments. We must consider centralization versus decentralization, locally developed technology versus centrally supplied technology, and, most importantly, the trade-offs between people and capital productivity. The latter is stressed because I view the systems professional as the successor to the functions previously done by industrial engineers when they increased the productivity of our goods-producing sectors of our industrial society. As we move towards an information-oriented society, our systems' analysts will have the jobs of engineering improved productivity from our corporate and public enterprise bureaucracies by means of improved uses of capital to perform labor intensive functions.

One of the reasons this focus is so sharp at Xerox is because we are in the office information business. We are also an information intensive organization and, therefore, the focus of how we manage our information resources is very, very sharp.

My presentation will address the following main topics:

1. The concept of project profitability.
2. The concept of technical project profitability expanded to examine the aggregate organizational productivity. Most importantly, I will discuss an innovative source of productivity accounting as a way of tracking the bottom line impact of technology on company profits.
3. A case study which examines the investment decision for a risky project.
4. The use of specific examples of how to look for new opportunities to improve our profitability.

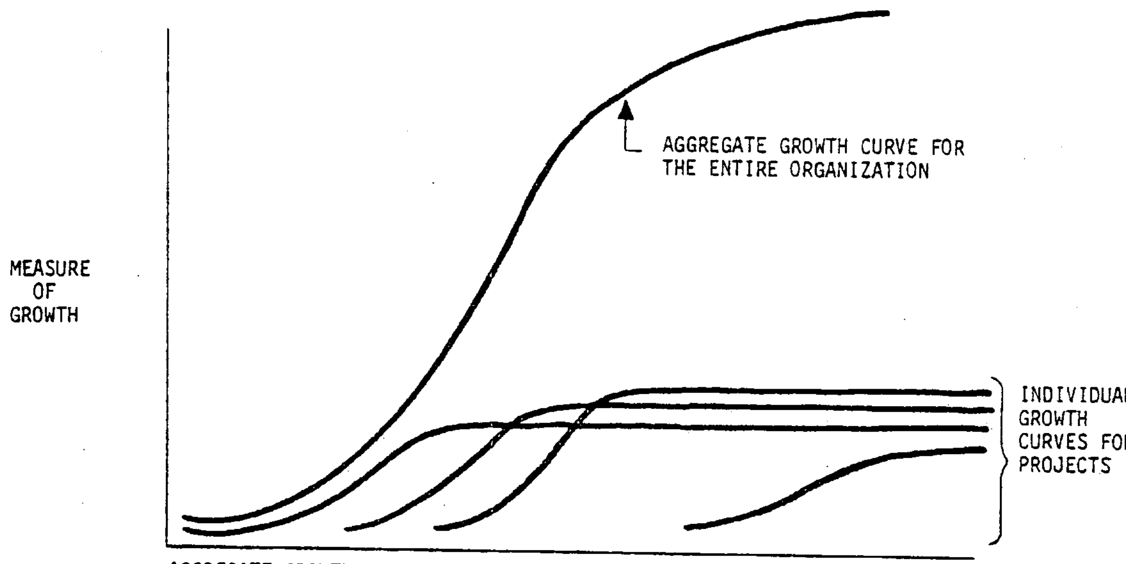
As a result of all these, I will then redefine the objectives for management information systems activity.

It is my intent to try to answer the question on the limits on growth in the information systems function. Are we beginning to get to the top of an "S" curve which augurs the decline in the past rate of growth? Have we already reached maturity or are there great prospects for further increases in the scope of the information function before us? Can we understand what are the driving forces which will explain a particular "S" curve for a particular enterprise?

Let me begin with an "S" curve for EDP budget growth. If one has held a job long enough to analyze the development of EDP in a single organization over 10-20 years, he finds that budgetary increments that make up a firm's smooth "S" curve history are actually made up of a multitide of individual learning curves as seen in Exhibit 1.

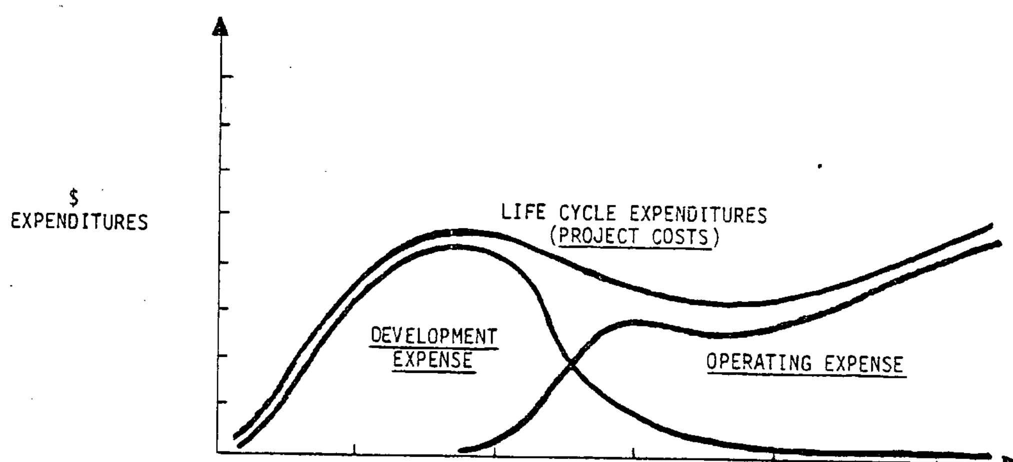
If projects are initiated in quick succession and they get completed successfully, EDP budgets rise rapidly. As a matter of fact, if the innovation rate stops altogether it is conceivable for the top of the "S" curve to decline as cost reduction activities drive overall expenditures down.

The key to the analysis of the growth in information systems budgets then lies in a careful examination of individual events causing project authorization as well as the overall timing of successive projects. Consider the cost curve generated by a typical computer project as shown in Exhibit 2. As a rule, the operating expense for a set of applications including maintenance and enhancements will equal or exceed the expenditure rates during development. This means that once an application is automated, it permanently adds to the fixed costs of the computerized or systematized sector of an organization. Technology improvements do not subsequently contribute much to cost reductions without investing further development funds, since technology "locks in" costs by tying in the application into a particular equipment configuration. Insofar as labor constitutes a major part of the cost (typically 50-70 percent of any EDP budget), inflation guarantees that the costs of all computer applications will grow with time. This point is best illustrated by looking at the economics of a large EDP organization as shown in Exhibit 3.



AGGREGATE GROWTH CURVE IS COMPOSED OF INDIVIDUAL PROJECT EXPERIENCES

EXHIBIT 1



LIFE CYCLE EXPENDITURE PATTERNS FOR A TYPICAL EDP PROJECT APPROXIMATE AN "S" CURVE

EXHIBIT 2

WEIGHT	FACTOR	INFLATION RATE
.65	Labor	+ 7 to +10%
.05	Supplies	+7 to +10%
	Computers	
.10	- CPU	-15 to -25%
.15	- Peripherals	- 5 to - 8%
.05	Telecommunications	0 to 5%
1.00	TOTAL EDP	+2.3 to +2.9%

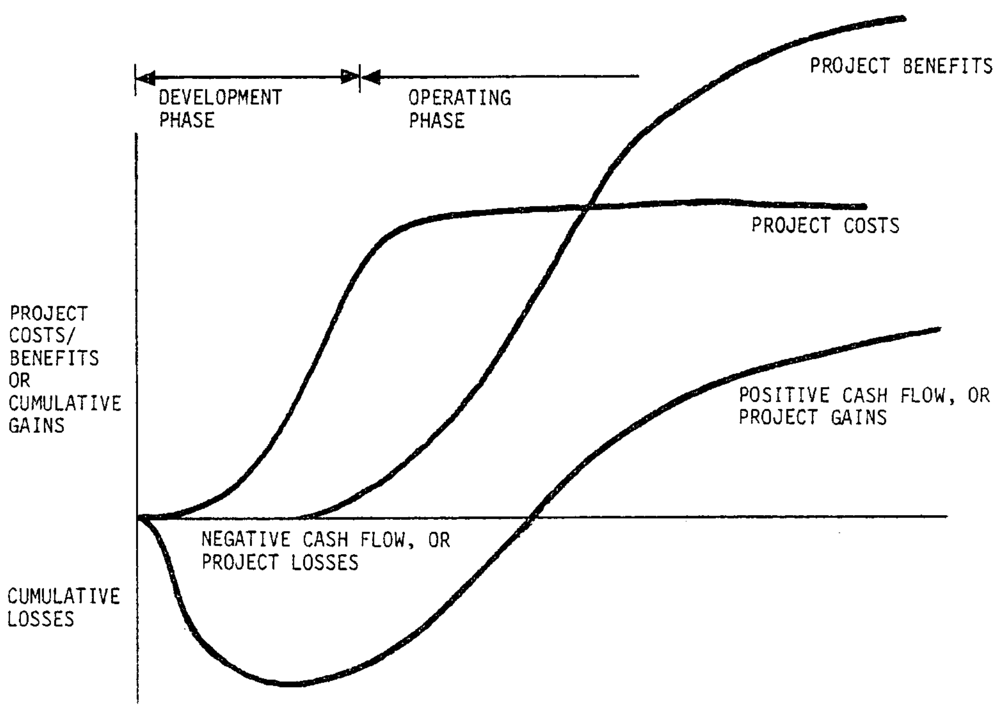
EDP BUDGET FACTORS - UNIT COST CHANGE RATES/% PER YEAR

EXHIBIT 3

I frequently hear what a great "buy" information processing is because of the fantastic improvements in computer technology. Despite these overwhelming arguments, when you look at the bottom line there is only about a 6 percentage point difference between labor costs which you are trying to displace and the EDP costs which you are installing. Therefore, I don't think technology is really the most important element in profitability of EDP projects. Unless the labor contents of EDP budgets decreases materially, the cost factors of the EDP organization will be only moderately better than those it will try to substitute for by means of automation. Watching the cost curves is, therefore, not the most significant variable in judging the speed with which an organization evolves through stages of growth. Project profibability--the cost/benefit ratios--is more likely to give us a clue about the desirability of new EDP projects.

Project Profitability

The shape as well as the ultimate level of an organization's "S" curve will be the result of several conflicting forces. Exhibit 4 shows a characteristic pattern of cost/benefit relationships where the gain or loss is defined as the positive or negative cash flow resulting from computerization. Several rules can be gleaned from these relationships:



CASH FLOW DURING PROJECT LIFE CYCLE

EXHIBIT 4

- Project development phase time should be short for an unstable environment. Otherwise expenses for maintenance for enhancements defer the breakeven point until the project becomes uneconomical.
- Projects should be selected primarily on their ability to generate positive cash flow. New projects should not be funded until a substantial portion of old projects is successful. A quick succession of new project starts would keep accumulating negative cash flows.
- Technological uncertainty in EDP project execution calls for a highly conservative approach to project selection. 100 percent over-runs on development expense and 50 percent over-runs on operating expense are not uncommon as a result of schedule slippage more than as a consequence of any other single factor. Because of this, return-on-investment targets well in excess of comparable capital budgeting targets are desirable. For instance, if a manufacturing corporation uses 10-15 percent return-on-investment (after tax) as its minimum target for new equipment, its EDP projects should have a minimum cut-off of 20-30 percent. Unfortunately, as the discount factor goes up, the impact of schedule slippage becomes even more objectionable.

High return-on-investment (ROI) results become very sensitive to the realization of estimated benefits. To return ROI's in excess of 30-50 percent before taxes requires attractive targets of opportunity. Consequently, benefits planning, benefits validation, and benefits assurance should receive equal or perhaps greater attention than systems planning, systems definition, and computer expense evaluation. Characteristically, technical project planning and control should consume 5-8 percent of total development costs. Clearly, we need to spend at least this much on the benefit side of the cost/benefit equation.

The real problem with benefit analysis lies in our inability to account for benefits actually achieved. EDP is only one factor of many in the cost structure of an organization. As organizations, personal accountability, work conditions, volumes of work, quality of performance, and procedures change, we are unable to track actual accomplishments against promised benefits. That's why I find most computer proposals oriented mostly toward the technical aspects of development, because spending a lot of time on anything else is not very productive. There are, however, techniques for benefit tracking and benefit auditing which justify doing a thorough job. This technique is productivity accounting.

Productivity Accounting

The following shows an application of this technique to management of information systems.

$$\text{PRODUCTIVITY TREND} = \frac{\text{QUALITY INDEX (CURRENT)}}{\text{QUALITY INDEX (PRIOR)}} \times \frac{\text{UNIT COST (PRIOR)}}{\text{UNIT COST (CURRENT)}} - 1$$

The ratio of unit costs is the primary indicator of achievement. The ratio means that if the total unit cost for performing a specified information-rich function (such as preparing a check, issuing a purchase order, processing a claim, handling an inquiry, etc.) is less currently than previously, then the productivity trend index will show an increase. The second ratio, Cost/Benefit, allows earning of productivity credits even if unit costs remain unchanged, if the qualitative aspects of the output of information services show improvement that has a direct influence on other trade-offs. An example of the Quality relationship to Unit Cost is shown in Exhibit 5.

Since unit costs can be tracked over an extended time period and can be generated as a by-product of a company's accounting system, it is then possible to make comparisons between planned and actual results without regard to volume or procedural changes. The essential ingredient in planning for new information investments in a particular department is a work breakdown structure which flows all costs into standard output categories. This then becomes the hub of planning for an incremental information system investment. If you go to a particular department and then to a particular level of organizational aggregation, you can look at the work breakdown structure and thus examine the overall effect of a specific incremental project investment on the cash flow for the entire activity. This is in contrast with the prevailing technique where isolated automation venture are porposed with only a rare opportunity to examine the effect on the entire organization over time.

As an illustration, consider a function like customer administration. Basically, customer administration until now at Xerox has been an overhead function as it is in most organizations. Since the strategic objective that we are following is to convert overhead functions into direct costs as in manufacturing, we must then structure our information functions by means of a "bill of materials" as manufacturing. The work breakdown structure of customer administration then entails functions like order entry, credit and collection, invoicing, commissions, and proposals. One of these tasks, for example credit and collection, can be further broken down into receivables adjustment,

UNIT COST	KEY SERVICE QUALITY MEASURE	COST/BENEFIT
CHECK PREPARATION	DAYS TO PREPARE	• CASH FLOW
CLAIM PROCESSING	ERROR RATE	• COST OF COMPLAINTS • COST OF OVERPAYMENT
INQUIRY HANDLING	RESPONSE TIME	• REVENUE LOSS • COST OF CORRECTION & FOLLOW UP

EXAMPLE OF QUALITY RELATIONSHIP TO UNIT COST

EXHIBIT 5

credit investigation, collection events, and bad debt management, each of which has performance indicators, unit costs, and quality measurements.

You can see then that what is of concern to us, namely EDP, is really at the very bottom of the work breakdown structure. It's almost the nuts and bolts of this whole assembly. Real productivity management means that you have to do level aggregation of efficiency before the impact of automation can be observed and operationally measured. Those of you who are in manufacturing are well acquainted with this approach. The approach to unit cost and parts management is completely analogous to the manufacturing work breakdown process and is used in mature industry to do "value engineering" as a way of improving profits.

Using this approach, it is then relatively easy to examine specific office automation investment proposals, and subsequently analyze actual performance taking into consideration the aggregate impact of complex inter-relationships.

Exhibit 6 shows a typical kind of planning display which is especially relevant for a top management presentation during a long range plan. This shows two functions, cost per invoice and cost per commission. It's one of several defined work breakdown components and it shows the track record. (It should be emphasized that these are not the actual figures; these are merely for illustrative purposes.) The actual productivity performance per invoice for 1974 was plus two-tenths of a percent productivity improvement. This is real productivity in constant unit cost terms. The performance was plus 3.4 percent in 1975, and something went haywire against the plan in 1976. By this means you can then get operating management accountability for the invoicing functions, and then, you can look at the proposed automation investment programs for 1977, 1978, and 1979 projects and see what the productivity commitment targets are.

In the area of commissions, we did not have the measurements in 1974 and 1975, but historical experience reflects negative productivity. When you start a productivity program, you should always compute historical productivity figures by doing cost analysis so that for planning purposes you can do better in the years to come.

The budgeting process which uses these kinds of productivity projections is overwhelmingly gratifying. I don't have to dwell on the usual budgeting games that use headcount analysis and take an operating manager through an inquisition-like process: "Why do you need this office; why do you need a coordinator; why do you need this or why do you need that?" Productivity management makes the operating process mature and very much bottom line oriented.

Project Profitability

We have now in our possession the concepts that permit us to answer new questions concerning the dynamics of a "stages" evolution in a specific organization:

1. Maturity in the introduction of computers occurs when the rate of innovation ceases. This is equivalent to saying that if the return-on-investment for our high risk activities falls below two times the investment "hurdle" rate--about 20-30 percent--the innovation will cease.
2. The rate of innovation for information systems projects is triggered by new projects having attractive cost/benefit ratios. Insofar as technology succeeds in lowering the cost element of the ratio, it permits consideration of projects previously deemed unaffordable. But technology alone does not dictate the stages of growth. All factors that have a bearing on a high project ROI (such as organizational capabilities to assure the realization of benefits, cost displacement opportunities, development risks, project management and control, etc.) have equal or higher importance.
3. The overall strategy of project sequencing and thus assuring positive cash flows is of greatest importance. Otherwise the organization will not be willing to engage in innovation through successful office automation investments. Management planning and control to detect, propose, and manage attractive cost/benefit projects will dictate the shape of an "S" curve in a specific situation.
4. The primary concern of the top information systems executive is management of ventures that improve organizational effectiveness and/or profitability.

		1974	1975	1976	1977	1978	1979
COST/INVOICE							
	- ACTUAL	+0.2%	+3.4%	-4.2%			
	- PLAN	+2.0%	+2.5%	+3.0%	+3.5%	+4.5%	+5.5%
COST/COMMISSIONS							
	- ACTUAL	-5.0%	-7.8%	-8.1%			
	- PLAN	N/A	N/A	N/A	+6.5%	+6.5%	+6.5%

EXAMPLE OF PRODUCTIVITY ACCOUNTING AND PLANNING

EXHIBIT 6

5. The top information system executive frequently cannot concentrate exclusively, on just managing technology costs. His job is much bigger. To budget new project investments optimally, he must be able to help in setting investment priorities by giving greater attention to expected benefits.

6. With increased scarcity of capital projected over the next 25 years--whether it is defined as investment in buildings, tools, R&D, or systems--organizations must begin redefining the role of their top information systems executives primarily as capital investment managers.

   Office automation investments must start competing explicitly with other investment opportunities needed for survival of the firm and as R&D, new products, or new facilities. With systems development budgets typically broken down in the 20-30 percent range for development and 70-80 percent for on-going expense and with systems expenses in the range of 0.5-1.5 percent of total revenue, systems development budgets frequently equal 10-20 percent of a company's R&D budget. Money for innovation is scarce and, therefore, requires top management attention. Also R&D or systems development investment share the common characteristic in that it has great leverage on on-going expenses or revenue. This is why the organizational characteristics of the information systems budgeting process changes not as a function of technology, but as its importance to the investment management process becomes apparent.

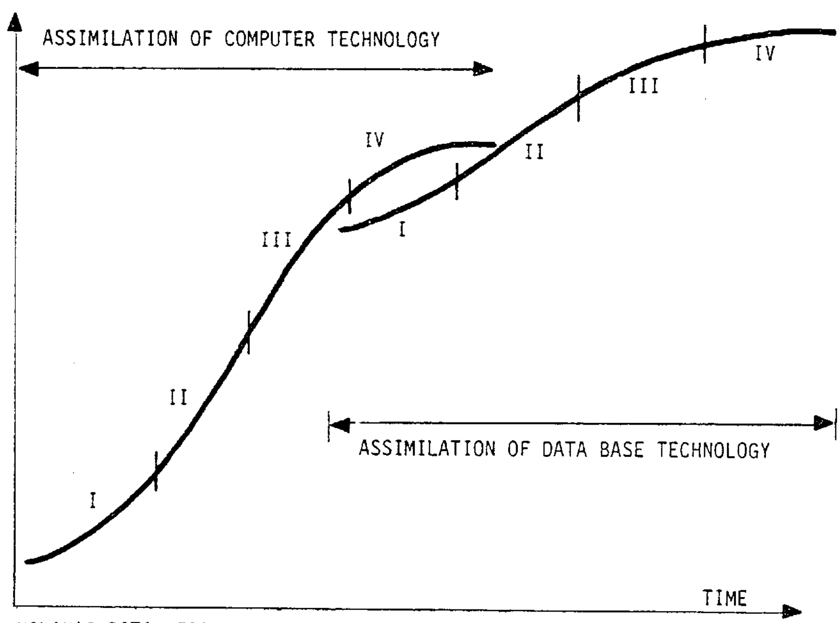
Application of Profitability and Productivity Concepts

These new insights allow us to examine a broader range of realities than was previously the case. For instance, Dick Nolan of Harvard is much concerned about the "fifth stage" of development. Since I believe that any aggregate "S" curve can be composed out of several subsidiary curves, Nolan's "fifth stage" can be drawn as a new and major technology venture consisting of projects in assimilating database technology. This is illustrated in Exhibit 7.

I am not so sure about this idea because I don't know what the ROI is on database technology. As a matter of fact, when examining investment opportunities, database investment does not show up as a separate ROI, because it's not a project that is a means for achieving specified profitable objectives. I view database management more as a new overhead function which will enable us to achieve significant cost reductions on individual applications someday. So far, however, database management programs I have seen have increased costs, not profits or short term productivity. I think a more meaningful way perhaps to do so is to look at a typical administrative job, and look at what are some of the economics today for a typical clerical unit cost.

Most importantly, the new analysis based on cost/benefit maximization profitability and innovation permit us to define the shape of an "S" curve possible for a specific organization, within a defined geographic and planning context. Simply put, drawing up of office labor automation long range plans can generate a particular "S" curve. The "stages of growth" theory then becomes a planning aid, because it allows a long range planner to map against his own curves those insights that experience has proven out elsewhere.

What is most attractive, however, is the realization that the "stages of growth" analysis can provide a helping hand in probing the limits of what is achievement. For instance, Fred Withington of A. D. Little tells us that firms will ultimately evolve toward ... "semi-automatic operating decisions, plans initiated by many individuals, systems capabilities projected to all parts of organization, interconnected networks, interactive languages, simulators, etc." Applying the cost/benefit maximization criteria to a particular firm may reveal that it is unlikely that payoff could be realized from such an approach and that a relatively rudimentary technology would suffice for the duration of the long range planning horizon.



NOLAN'S DATA RESOURCES HYPOTHESIS DRAWN IN AN "S" GROWTH CURVE

EXHIBIT 7

Example

Consider as a unit of work a "job," which can be defined as a work station for performing a set of administrative and clerical functions. The average U.S. current cost for performing the assigned functions will be about $15,000 per annum, as demonstrated in Exhibit 8. The productivity improvement for a very successful automation application runs about 8 percent "real" change.

Eight percent is suggested because the aggregate productivity for the United States today is visibly low. It is one of the lowest of the Western countries and hovers around 2 percent. I don't think we can afford to take our sector of the economy--information processing--which has the most advanced technology to move at the same speed as the rest of the country. When you look at a typical "mix" of how a company should become productive, it turns out that our function, which is the beneficiary of the most advanced technology that our society possesses, should be doing materially better than the average to compensate for those areas, such as government and social services, which so far escape achievement of productivity improvement.

After allowing 7 percent for inflationary increases in unit costs, our target for improvement will be 15 percent. The reason why an administrative manager may not automatically claim inflation as an "allowance" reflects the current economic realities where price increases to offset inflation are increasingly difficult to realize. Because of risks, we need to be realistic in assigning a high discount rate of 30 percent and a relatively short project life of 5 years. Standard financial analysis tables will lead us then to computing the maximum investment allowed to achieve the desired results.

Unfortunately, labor savings projects through office automation do not consist of a single capital purchase, at project initiation, but have a project life cost distribution made up of:

- development costs
- operating and maintenance costs

Referring back to one of the earlier curves, it is seen what $5,700 per maximum allowable investment will buy. A rough estimate shows that it gives an on-going operating cost allowance of $500-$1,000 per job per annum for office automation equipment plus about $1,000-$1,500 for start-up cost. Since training, conversion, and learning curve effects dominate program budgets during start-up, at best there is only a $400-$800 development cost left for technology acquisition, software development, project control, and methods planning. Such a small development budget for achieving such large savings creates a tough economic task. If cool economic analysis is applied to these new ventures, it is found that only a few attractive opportunities will meet this goal.

Consider some figures as an example. A fully loaded IBM 370/168 will cost, at the most effective level of utilization, between $20-$30 thousand per work station per year, not counting telephone communications cost and development expenses. At the other end of the spectrum--using a minicomputer to support a work station--considering a terminal plus controller plus minicomputer--approximately $34,000 will be spent on a minicomputer (purchase), but then, development costs plus maintenance will bring costs to $10-$20 thousand per work station per year unless there is a huge base from which to amortize development expense.

Attractive investment opportunities are tough to find in the world in which we have been living so-far. The kind of return like 30 percent over 5 year life, is hard to come by. High returns on investment are only realizable if a new way of doing things is discovered which previously was not possible without technology.

Planning for New Opportunities

This approach is especially relevant to the formulation of long range plans and strategies of organizations that have arrived at the end of their dramatic growth experiences with EDP. The flattening of their budget curves has been almost equally caused by a loss of justifiable new investment opportunities and the increasingly stringent resources allocation processes in the last few years.

The lack of attractive new investment opportunities in productivity improvement applications is partially due to a narrow concept of EDP missions and charters. When one views the extent of office automation, the rate of growth of the "white collar" sector in the economy, the increased complexity of information handling demanded by our society, and the high rate of inflation on labor rates while the cost of technology is droppong radically, it is hard to accept the idea that we have reached maturity in growth of office automation. For example, we can look at one estimate of the costs of U.S. office expenditures for 1973 as shown in Exhibit 9. The extent of investment intensity is far from a saturation level since the average investment, per white collar worker, rarely exceeds $4,000-$6,000. If we contrast this with capital needed per agricultural worker (about $50,000/capita) and factory worker (about $25,000/capita), we can quickly understand why the productivity for the agricultural and manufacturing sectors is so high (in the 6-8

CLERICAL AND ADMIN. UNIT COST/PER JOB/PER YEAR:

(10,000	+	2,300	+	1,500	+	2,000) x $\frac{2}{3}$	=		$15,800
(Base)		(Benefits)		(Direct Overhead)		(Indirect(Availability) overhead)			COST

PRODUCTIVITY IMPROVEMENT FOR VERY GOOD PROJECTS:

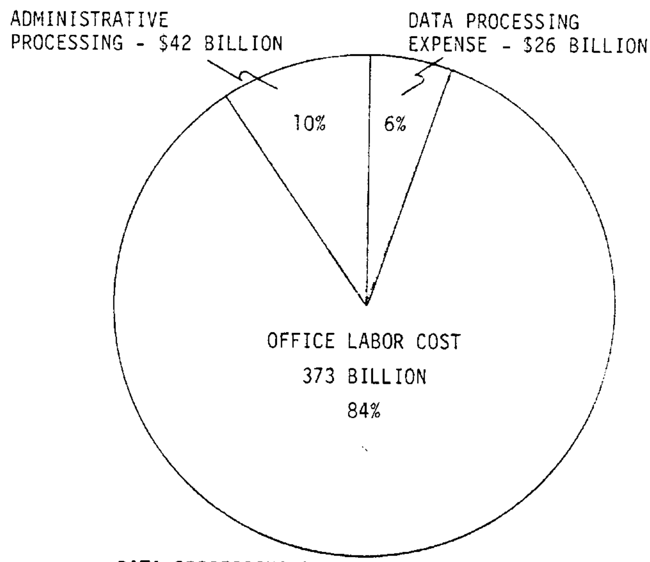
8%	+	7%	=	15%
(Real Productivity)		(Inflation)		(Improvement/annum)

PROJECT INVESTMENT, PER JOB, FOR VERY GOOD LABOR SAVINGS PROJECT

$$\frac{\$15,800 \times 0.15}{0.415^*} = \$5,700$$

*Capital Recovery Factor @ 30%, 5 Year Life

EXHIBIT 8



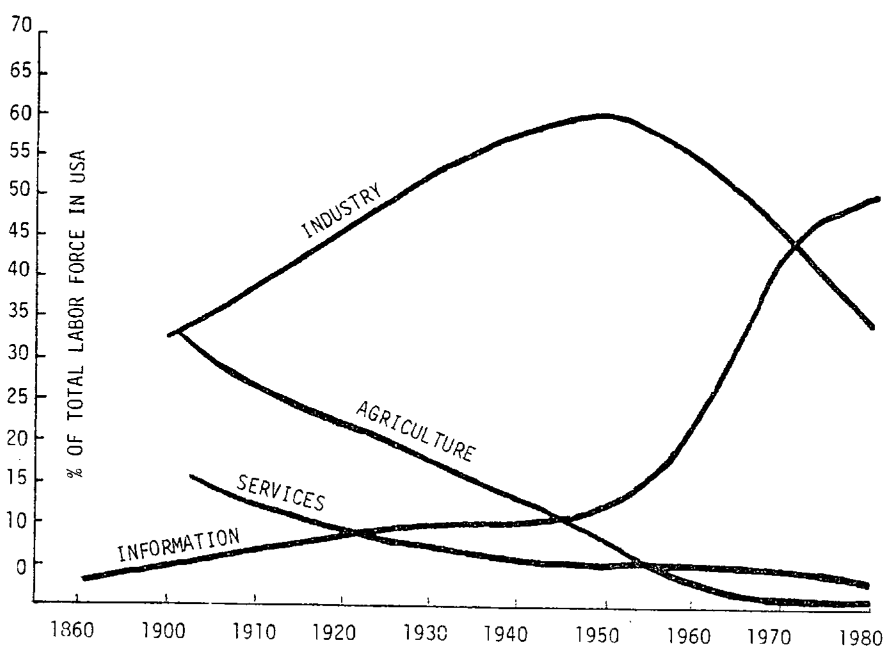
DATA PROCESSING AND ADMINISTRATIVE PROCESSING EXPENSE
AS RELATED TO COST OF OFFICE LABOR

EXHIBIT 9

percent range, per annum, in real terms) while the productivity of our economy at large hovers within an unsatisfactory 2-3 percent range. The task of finding profitable and productive opportunities in information processing is not just a way of safeguarding job opportunities for computer people. It is an objective calling the national economic priority because our society is finding it increasingly desirable to migrate its labor force from highly productive agricultural and industrial sectors into low productivity information intensive occupations.

This is illustrated in Exhibit 10 by showing occupational trends for the United States population since 1890. This chart shows that we started migrating agricultural workers at the turn of the century from about 35 percent of the labor force to the current 3 percent plus, while we were building up our industry base. We peaked our industrial employment just after the Korean War and have been declining this sector as the percentage of the total labor force ever since then. Crossover took place quite recently. The information sector curve includes information rich

U. S. LABOR FORCE



SHIFT IN USA OCCUPATIONAL CATEGORIES 1900 - 1980

EXHIBIT 10

occupations, such as clerical, administrative, and managerial jobs. It also includes teachers, accountants, auditors, EDP people, secretaries, and so forth. One of the reasons why the current real income per capita in the United States is flat is that we have been trading directly productive people for overhead people who do not necessarily contribute to output of the economy. This is why systems people--the industrial engineers of the information society--have huge responsibilities and opportunities to make sure that the nonproductive--overhead--sector of the economy is productively employed.

Redefining the Future Objectives for MIS

Definition of the "stages of growth" for any organization must consider its total information processing expenses, including clerical and administrative labor, as the base against which progress should be measured. The big divide is then that portion of the total information processing expense that is subject to systematized control, measurement, and explicit capital investment management. If, for instance, an organization spends about 1 percent of its revenue for EDP, this will show only a relatively small penetration into areas remaining "unsystematized." As a rule for every dollar of EDP expense at Nolan's Stage IV, there will be an additional $5-$15 falling into unsystematized activities, including the work of typists, secretaries, order entry clerks, administrators, switchboard operators, accounting analysts, budget specialists, file clerks, claims examiners, credit specialists, expediters, etc.

For a typical organization we will find coexistence of several technologies and of several investment opportunities simultaneously at various stages of development. EDP may be at Stage IV, telecommunications in Stage II, word processing in Stage II, and general administrative systems just beginning to emerge. This means that EDP, as it is defined today, is only one facet of the information processing environment and that overlapping EDP are many other dimensions for tackling the overall problems of "white collar" productivity shown in Exhibit 11, at various stages of their respective "S" curve development.

The purpose of this article is not to dwell on the attributes of the various "stages" that go beyond EDP. It is important to note that I see great opportunities for improved cost/benefit performance in these areas because of their latent potential originating from the fact that these sectors have been largely neglected in the last 10-20 years when most energies were diverted by the glamour of EDP. I can see how project development resources will be shifted where the potential is greatest, as increased understanding takes place concerning these opportunities. Exhibit 12 illustrates the results from a test of several word processing installations using Xerox word process equipment. The financial results are dramatic and are substantially better than our expectations. The improvement ratios are certainly superior to just about every EDP project I have seen recently.

Before my colleagues in computer management abandon their EDP projects and shift their energies to word processing, I would like to warn them that success in this new field is hard to come by. Planning the human factors for successful word processing is of substantially greater complexity than just about anything encountered in EDP except perhaps in large scale online terminal networks. The issues are socio-cultural--both on the part of the users

	INITIATION	EXPANSION	FORMALIZATION	MATURITY
DEVELOPMENT SECTOR	STAGE I	STAGE II	STAGE III	STAGE IV
EDP	COST REDUCTION	PROLIFERATION	CONTROL	DATA BASE
TELECOMMUNICATIONS	TELEPHONE COMPANY SUPPLIED	INTERCONNECT DEVICES	INDIVIDUAL NETWORKS	INTERGRATED SWITCHED NETWORKS
WORD PROCESSING	PRIVATE SECRETARIES	TYPING POOLS	WORD PROCESSING	TEXT MANAGEMENT
ADMINISTRATIVE SYSTEMS	MECHANIZATION OF TASKS	MACHINE AIDED TRANSACTIONS	WORK REDESIGN	WORK ENLARGEMENT & COMPUTER AIDED INSTRUCTION
DECISION SYSTEMS	ANALYTIC GENERATORS	PLANNING MODELS	INTERFUNCTIONAL SIMULATION	HIERARACHICAL HEURISTIC MODELS

EXHIBIT 11

BASIS	PRE-IMPLEMENTATION	CURRENT	CHANGE
ANNUAL SALARY	$3,647,000	$2,804,000	
AVERAGE PER INSTALLATION	331,000	255,000	- 23%
NUMBER OF EMPLOYEES	264	203	
AVERAGE PER INSTALLATION	24	18.5	
	SUPPLY SAVINGS		
ANNUAL SUPPLY BUDGET	$ 203,000	$ 142,000	- 30%
	TEMPORARY/CONTRACT LABOR		
ANNUAL BUDGET	$ 129,700	$ 40,500	- 68%
	OUTPUT (LINES OF TEXT/MONTH)		
FIVE INSTALLATIONS MONITORED	51,834	70,000	+ 35%

SAMPLE OF XEROX EXPERIENCE WITH WORD PROCESSING

EXHIBIT 12

as well as by the word processing operators. Word processing requires a reorientation of job attitudes, improvement in career path perceptions, changes in work habits, development of new measurements, and a redefinition of what is meant by secretarial services. In terms of organizational structure, the establishment of a network of word processing centers requires an approach that differs materially from the ways we implement computer projects. It is a challenge that I recommend for each information processing executive to take up because it contains all of the elements of complexity that will be encountered someday as we move toward automated administrative systems which are also labeled as the "office of the future" environment.

One more remark about attractive cost/benefit opportunities outside of the conventional EDP sector: the involvement of this information systems executive in the telecommunications area. I consider the need for integrating telecommunications (voice, data, facsimile, administrative messages, teleconferencing) planning an absolute requirement for achieving any semblance of cost effectiveness. Telecommunications systems management are broken down into small pockets of control, without any integrative planning, in most organizations. Advancing into future growth stages calls for managing profitable new projects in this area.

With regard to "decision systems," the best we can say is that this discipline can be expected to improve the productivity of management personnel in the same way as administrative systems are targeted at improving the productivity of clerical and administrative staffs. The theory of what constitutes the "stages of growth" in this area is yet to be written.

Summary

The investment in information systems for increased profitability relates to the systematization of all new investments needed to improve the productivity of people engaged in information processing. To understand this investment process requires insights that stretch beyond computer technology. Telecommunications, word processing, administrative systems, decision systems are some of the classifications that may become useful in comparing profitability in diverse organizations, at comparable stages of development.

We have pointed out that the driving force behind evolutionary growth is profitable innovation--the ability to find new project investment ventures. For future growth the executive will have to reach increasingly into more difficult areas requiring major changes in organization and in work relationships. Attention to technology matters in this environment will not be as important as the ability to secure the benefits arising from automation. As advanced stages of growth are attained, the EDP executive will be left to grapple with technology. His boss--the Information Systems executive--will manage the new investment opportunities leading to dramatic improvements in overall organizational profits and performance.