

# Management Adviser

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## Management Adviser, Volume 8, Number 3, May-June 1971

American Institute of Certified Public Accountants

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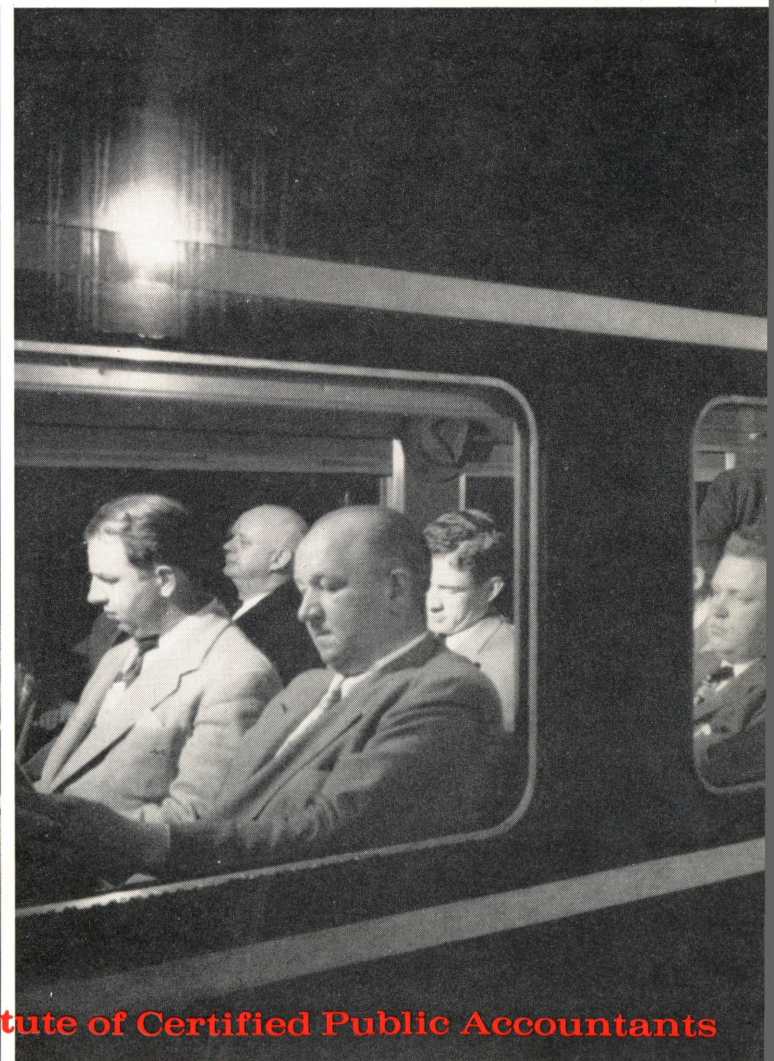
# management adviser

(formerly *Management Services*)

May-June, 1971

## A Business Solution to Overcrowding and Inflation

*Reuben W. Abrams*



**A Publication of the American Institute of Certified Public Accountants**

# Here's why Mr. Roche of General Motors thinks investing in minority business is just plain good business.

In April 1970, a new General Motors subsidiary became one of the first Minority Enterprise Small Business Investment Companies (MESBICs) to be licensed by the Small Business Administration (SBA).

Our desire to participate speedily in this partnership of effort between business and government stemmed from a common concern: in America today, free enterprise is not as free as it ought to be.

Fewer than 3% of the owners of American businesses are found among the 30 million black, Spanish-speaking or Indian Americans who constitute 15% of our population. These minority Americans have less than an equal chance to own a business.

The MESBIC program intends to help these Americans.

Seed capital provided to a MESBIC by its corporate sponsor is matched two-for-one by SBA. The company then makes interest-bearing loans to promising minority businesses, additionally investing management talent and assistance according to its areas of expertise.

Through SBA loan guarantees, the capital ultimately channeled to qualified minority enterprises can be leveraged to as much as fifteen times the sum initially provided by the corporate sponsor.

Business ownership carries with it no guarantee of success. No one knows that better than the businessman. But every man deserves an equal right to try and an equal right to fail. In business ownership, as in employment and housing and education, every man's opportunity must be made equal to another's.

The MESBIC program offers an effective means to provide minority businessmen with capital and to train and equip them with the knowledge and experience they will need to be able to compete on equal terms.

We at General Motors are proud to be among the first to make this imaginative concept a reality.

I hope every American businessman will give the most serious consideration to how he and his company can ally themselves in this effort to develop new business opportunities for our minority citizens.

For complete information on MESBIC sponsorship, write to: A. S. Venable, Director, Office of Minority Business Enterprise, United States Department of Commerce, Washington, D.C. 20230.

James M. Roche, Chairman of the Board, General Motors Corporation



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# MANAGEMENT ADVISORY SERVICES FORUM

Gentlemen:

In quantitative terms how accurate should management expect a budget to be? How does it go about setting parameters of accuracy which it can then use to evaluate the effectiveness of a budgeting group?

Do you know of any literature which addresses itself to this problem? Frankly, we have had little success in routine requests to libraries of associations and universities.

Your help would be very much appreciated. If there really is the dearth of material that there appears to be, your comments on why this is so would be valued.

*Two members of the MAS Forum panel replied to this question. Here is the first reply, received from a large Eastern firm:*

The question appears to be a loaded one, betraying feelings of having been treated unfairly. There may also be overtones of defensiveness. In such a case, no answer is likely to improve matters, or even to afford satisfaction.

First, let it be said that there is no single standard of accuracy, because varying potentials for accuracy inhere in specific items within a budget. Certainly the techniques for arriving at forecasts of sales are less precise than the methods

for calculating estimates of cost. Furthermore, the input data are likely to be less reliable for sales forecasts than for cost estimates.

A budget group's responsibility for sales forecasts lies in using the most appropriate techniques available and the most reliable information. They can match their total sales forecast with macroeconomic projections of gross national product and their product line forecasts with industry estimates from Input/Output charts. For individual products, they can extrapolate trends and generate internal data on product life cycles. They can also take into their calculations customer inventory levels, advertising

## PANEL OF ADVISORS:

Under the auspices of MANAGEMENT ADVISER, a panel of management services advisers from leading accounting firms have agreed to answer to the best of their ability questions about any area of management advisory services

WILLIAM E. ARNSTEIN, *Main Lafrentz & Co., New York*  
PHILIP L. BLUMENTHAL, *Geo. S. Olive & Co., Indianapolis, Ind.*  
ROY A. LINDBERG, *J. H. Cohn & Company, Newark, N. J.*

with which readers would like help. Both questioners and advisers will remain anonymous. One or more of the following members of our panel are responsible for the answers published in this department:

ARTHUR B. TOAN, JR., *Price Waterhouse & Co., New York*  
H. G. TRENTIN, *Arthur Andersen & Co., New York*  
ALLEN WEISS, *Laventhol Krekstein Horwath & Horwath, New York*

and promotion plans, and segmented market data.

Having done all these things, a budget group must face the occupational hazards of prognosticators with heads held high and fingers crossed. Courage is a requisite of the job, even though others are consulted and agreement is sought, whether the Delphi technique is employed for this purpose or some less formal method.

Even with the best of techniques, some items defy prediction. A new product that is radically different from anything on the market presents special problems. And if competitors are in a race to bring similar products to market, the problems are accentuated. Besides, market studies, on which new product plans are based, are probably not conducted by the budget group. Hence, the budget group's responsibility for new product forecasts is ordinarily limited.

### ***Degrees of precision***

Whereas sales forecasting is subject to large errors of prediction, expense estimating can be made much more precise. Flexible budgeting, based on analysis of expenses into fixed and variable components, takes the sting out of departmental volume variances.

Still, rising prices and fluctuating prices can cause difficulties. Where price fluctuations can be severe, as for products made out of commodities, it may be better to budget gross margins instead of sales and cost of sales. Even less erratic price movements are not necessarily predictable by the budget group; accordingly, they are likely to get their estimates from the purchasing agent. In that case, the responsibility for price variances lies with him.

To discuss fully the subject of budget accuracy, we need to concern ourselves with the purposes of the budget. For some objectives require greater accuracy than others. We may take the purposes of a budget to be financial planning, coordination of operations, and con-

trol; and we may consider the requirements of each with respect to accuracy.

In financial planning, prediction is important, but tolerable levels of input error vary over a wide range, as sensitivity analysis studies have shown. It is a good idea to determine where the sensitive areas lie, so that concentrated efforts can be made to tighten up there.

In coordinating operations, volume ranges rather than specific figures are generally used for decisions concerning preparatory measures. Consequently, estimating precision is seldom critical in this aspect of budgeting.

When budgeting is used for control, variances caused by inefficiency among operating people are their responsibility, and the effort is directed toward improving their performance. If a budget is too tight, however, resentment may develop toward the budget group for treatment that is considered unduly harsh. It is the business of budget people to set reasonable standards of performance, standards that are neither too stringent nor too lax.

But variances are not always the fault of the operating groups. If the standards themselves are faulty (not merely tight or loose), then it is up to the budget group—with the assistance of the operating people, if that is possible—to work out better methods. They may find more reliable relationships on which to base their estimates, or better definitions of recognized relationships from which to calculate their parameters.

The use of information fed back from one budget cycle to improve the estimating methods of the next cycle is essential to sound budgeting. A budget group that neglected to gather feedback and make use of it would be derelict in the performance of its duties.

To summarize, there can be no single standard of accuracy that would apply to all parts of a budget; nor do the separate purposes of budgeting require a uniform standard of accuracy. The ingredients of good budgeting are: the

best available information, the most appropriate techniques, sound judgment, and a little luck. For persistent problems, the remedy may be flexible budgeting and break-even analysis.

*. . . and here is the second, which comes from a major firm with headquarters in New York:*

Given an accurate sales forecast, an annual budget of costs can be quite accurate, say plus or minus 2 to 3 per cent. Individual accounts may be expected to show larger variances, but pluses tend to offset minuses, bringing the total within this range. This degree of accuracy is only possible if there are no major unanswered questions when the budget is prepared and no major changes in operation occur within the year. Larger variances are acceptable if budgets cover periods beyond one year.

The types of unanswered questions which tend to plague budgets are:

Union contracts,

Raw material price trends,

New products,

New manufacturing or sales facilities, and

Pollution control.

Operation changes which may occur unexpectedly include strikes, fires, major machinery breakdowns, unsatisfactory product quality, and any changes in basic company policies.

In some instances, operating management will attempt to satisfy top management that it is adhering to its budget by cutting back on so-called "programed costs." These are costs such as advertising, research, and training which are discretionary in the short term and can be cut back almost immediately.

Needless to say, budgeted costs in manufacturing tend to be more accurate under a standard cost system which is itself closely controlled and in which the standards have been properly determined.

Many companies feel that the

forecast of sales is sufficiently subject to error that they produce a variable budget, i.e., a budget in which certain costs are budgeted as a percentage of sales. Although the annual budget will show a specific sales figure, comparisons with actual show variable costs as the budgeted percentage of actual sales. This method is perhaps the fairest way of judging operating management's ability to control costs.

All of this leaves unanswered the question of how accurate a sales forecast or budget is expected to be. Methods of preparing such forecasts, including analysis of economic trends, the company's growth pattern, expectations with regard to specific industries to which the company sells or even in relation to specific customers, have been the subject of many books and many articles. Grass roots projections and top-down projections are usually covered. However, the accuracy which may be expected is still dependent on the company's industry and its percentage share of the industry.

For example, a company selling bread to a chain of supermarkets can forecast more accurately than can a manufacturer of hula hoops. A company building naval vessels with long lead times can forecast more accurately than a company operating a jobbing machine shop in which each month's business is related to its success in bidding in the prior month. An Eastman Kodak can forecast quite accurately because its share of the market is so large that its sales will depend on economic conditions and its own sales trends whereas a company selling one-tenth of one percent of all monkey wrenches manufactured could easily triple its sales by acquiring one large new customer.

Possibly the foregoing is more nearly an answer to the last paragraph of your inquiry, wherein you ask why there is so little material indicating what range of accuracy is acceptable in budgeting. It also attempts to indicate the areas within a budget in which accuracy may be expected.

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**Reuben W. Abrams • A Business Solution to Overcrowding and Inflation . . . . . p. 21**

More efficient use of our resources could go a long way toward solving some of our persistent economic problems. This author has two specific suggestions to offer: year-round operation of the schools and round-

the-clock operation of most businesses, with staggered work days. He explains how these simple steps would make equipment more productive and benefit workers as well.

**John J. Mariotti • Checklists in Problem Solving . . . . . p. 28**

The checklist, an analytical framework used to make sure that nothing is overlooked in executing a task, is useful in many aspects of everyday life—from shopping in a supermarket to driving a car. This

author says he has found checklists indispensable for efficient business problem solving. In this article he tells how to prepare and use them, with illustrative examples.

**Carlton D. Stolle • Computer-Based Audits . . . . . p. 38**

No longer, says this author, is it difficult to envision a general purpose audit program that is capable of almost entirely eliminating human intervention. That does not mean the auditor will abandon the exercise

of his judgment but rather that he will be relieved of much of the burden of tedious calculations and freed to give more creative attention to his client's problems.

**Louis M. Kessler • The Accounting Profession's Opportunities in EDP—  
Today and Tomorrow . . . . . p. 44**

This speech by the immediate past president of the American Institute of CPAs evaluates the challenge and the opportunities that the computer presents to the accounting profession, both in auditing and in man-

agement advisory services. Three areas of service are stressed: liaison between management and EDP technicians, advice on selection of software, and general accounting services.

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# management adviser

(formerly *Management Services*)

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**Staff Report • Sixth Annual AICPA Computer Conference (Part II) . . . . . p. 49**

The impact of the computer on auditing is emphasized in this continuation of the report on last year's San Francisco computer conference, with particular

attention to the need for EDP training as a basis for auditing computer-maintained records. Other topics include EDP service centers and tax services.

## DEPARTMENTS

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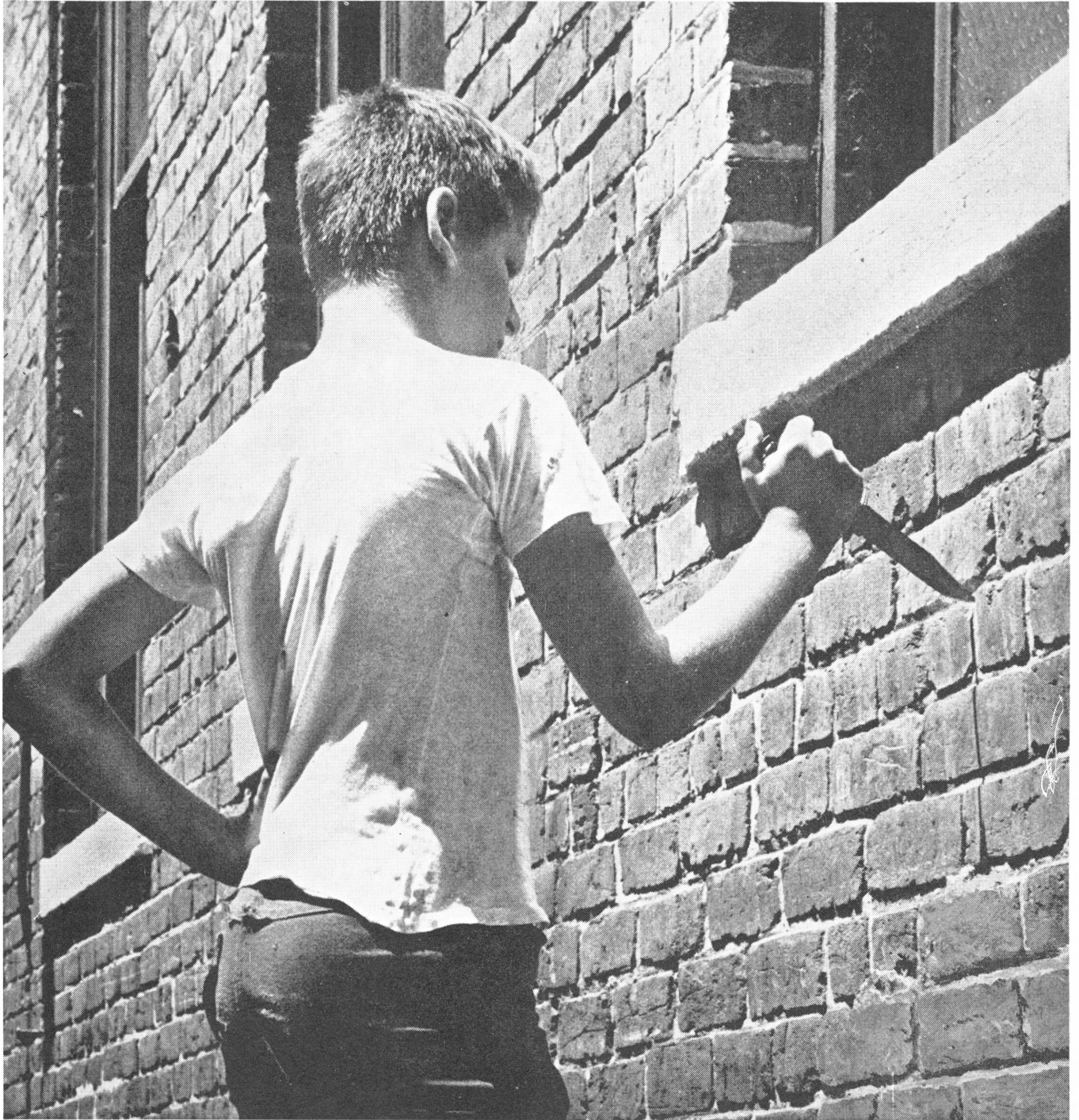
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# people, events, techniques

## Basic American Rights Threatened by Data Banks, Professor Warns At Senate Hearing; Government Witnesses Deny Infringements

Testimony — both pro and con — on the computer's efficiency in amassing dossiers on individual Americans — their private lives, their debts, their sex habits, their job records, their political inclinations — continued to accumulate in Washington last month as Senator Sam J. Ervin Jr.'s Subcommittee on Constitutional Rights completed four weeks of hearings on the use of government and private data banks.

Meanwhile, a group of computer professionals in New York issued a call to arms to their own colleagues to prevent such data accumulations on private individuals.

"Whether he knows it or not," Professor Arthur R. Miller of the

University of Michigan Law School told the Senate subcommittee, "each time a citizen files a tax return, applies for life insurance or credit cards, seeks Government benefits, or interviews for a job, a dossier is opened under his name and an informational profile on him is sketched."

### *Custodians won't guard public*

Professor Miller warned that the Government has extended its surveillance and information gathering activities to such an extent that the basic American rights of "privacy, speech, assembly, association, and petition of government" are being threatened.

"It is simply unrealistic to assume that the managers or proprietors of computer systems — government or private — will take it upon themselves to protect the public against misuse of the data in their custody," Professor Miller said.

Robert P. Henderson, associate group vice president of Honeywell Information Systems, told the subcommittee that both Government and business have responsibilities to protect the right of individuals to determine for themselves what information is to be communicated about them to others.

Mr. Henderson pointed out that information in a computer is safer than information stored in a file

cabinet. He outlined several devices computer manufacturers have devised to prevent unauthorized use of computer files. Among these are codes and a variety of personal identification and password systems. Fingerprint scanners, picture phones, and voice-print analyzers are under study to determine their feasibility for keeping files secure, he said.

But data file security is only part of the picture, Mr. Henderson said. New legislation is needed to give the right to privacy the same status as the rights to life, liberty, and property, he added.

"I would urge upon every user who maintains a data base that he exercise concern over the matter of privacy and security at the very beginning of the system design stage," Mr. Henderson advised. "Building concern for the problem into the system from the very first is much more effective and more economical than adding devices or altering the system after it has been installed."

### ***Systems called essential***

One of the few staunch supporters of computerized data banks to appear before the subcommittee was Dr. Robert R. J. Gallati, director of the New York State Identification and Intelligence System. Dr. Gallati believes such systems are "essential for the administration of criminal justice" and that, with adequate security, they can be operated without unreasonable invasion of privacy. Security is maintained in the New York system by limiting the users, restricting the type of information programed, forbidding unauthorized disclosure, and allowing individuals to see and correct their own files.

While many of those who testified before the subcommittee urged new legislation to restrict the information gathered about a person, Assistant Attorney General William H. Rehnquist said the Justice Department would oppose any legislation that would limit its ability to gather information.

"Self-discipline on the part of the executive branch will provide an answer to virtually all of the legitimate complaints against excesses of information gathering," Mr. Rehnquist said.

Another Administration representative, Secretary of Health, Education and Welfare Eliot L. Richardson, noted that the increased use of social security numbers to identify citizens did produce a potential danger. "The potential for invasion of privacy or breach of confidentiality of information lies not in the use of the number itself, but rather in how the organization uses computerized collections of data which are indexed by the number."

Secretary Richardson noted that while some people believe the issuance procedure for social security numbers should be tightened to make the numbers more reliable identifiers, others express concern "about increased risks of invasion of privacy that may result from the existence of a universal identifier, particularly in computerized data exchange."

While in Washington the Senators were listening to organization executives discuss possible action to limit data gathering, a group closer to computer operations was meeting in New York. The three-year-old group called Computer People for Peace was meeting to discuss how data handlers can limit the formation of electronic dossiers.

Michael Fought, editorial director of two computer magazines, told the group, "The data bank is your fight—you are the ones who can stop it. . . . There's no way data banks can run without you. . . . How many of you know what the information you're programing is really being used for? Find out. If it's something you don't approve of, say so."

While members of the group recommended passage of laws limiting the types of information that can be collected, other more militant solutions were suggested. One systems analyst said, "You can't tell me that we can't scratch files clean. I could wipe out a thousand peo-

ple's work in one night by writing through one program."

Dow Chemical Corp.'s Midland, Michigan, data research computer center has already felt the wrath of knowledgeable protesters, *The Wall Street Journal* reports. With the aid of circular magnets about the size of a quarter, data on 1,000 of Dow's tapes were erased by an antiwar group.

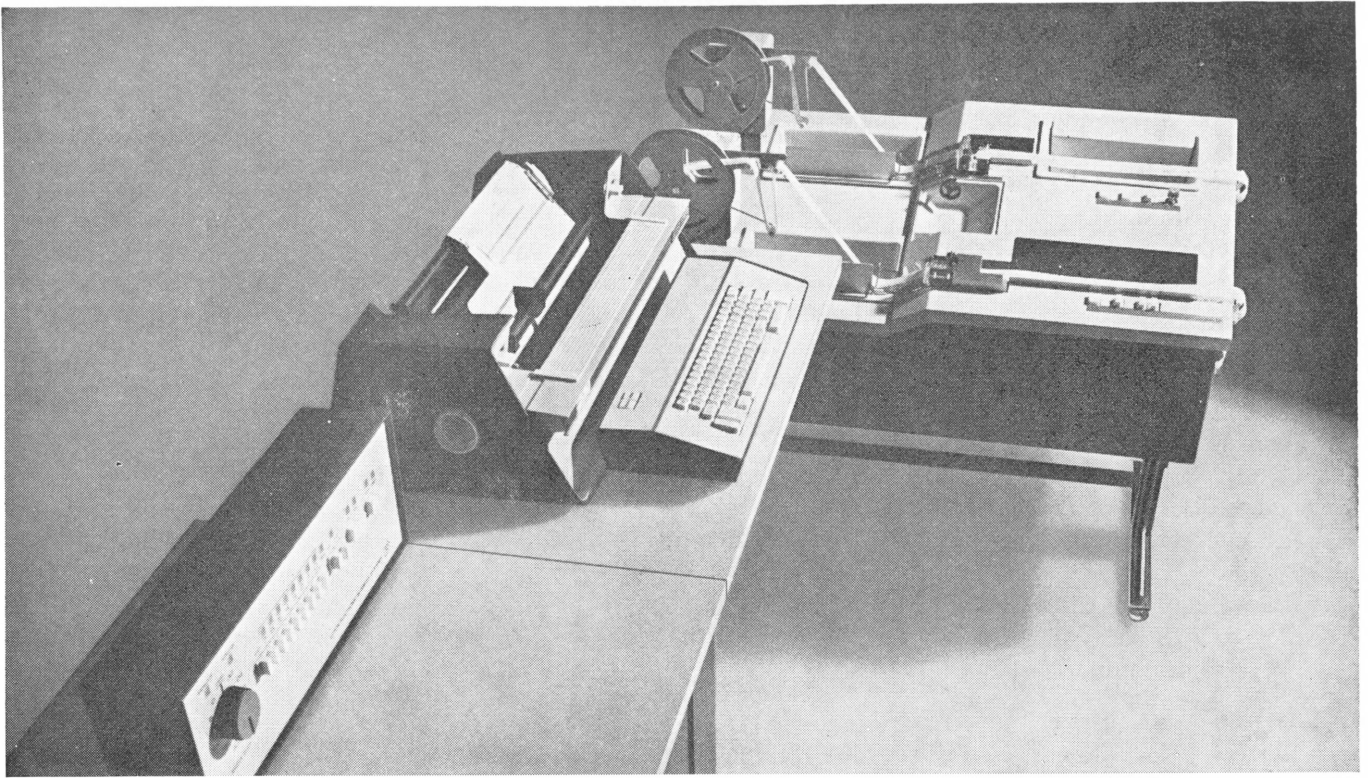
The *Journal* also reports that last year a Chicago underground publication, *Seed*, counseled would-be computer saboteurs to become computer operators and programers for the institutions they want to destroy. *Seed* also gave explicit directions on how to wreck computers and erase tapes.

## **Environment, Population Needs Must Precede Expansion: Rockefeller**

Basic limitations must be set on the United States economic system for the sake of environment, John D. Rockefeller 3rd, chairman of the President's Commission on Population Growth and the American Future, told The Conference Board recently.

"In both the population and environmental fields, we now increasingly understand that the harvest of unrestrained growth is pollution, social unrest, the manifest breakdown of essential services," Mr. Rockefeller said. "A true accounting, I believe, would show that the social effects of such growth are now overwhelming the gains we think we have made by a rising sales curve."

Mr. Rockefeller urged businessmen to do "much more than business as usual." He advised, "Business decisions of all kinds—industrial processes, waste disposal, the development of new products, the way products are packaged—increasingly will have to take into account possible effects on environment."



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Business and government must examine our economic system qualitatively as well as quantitatively, he continued. "Reconsideration of our methods of measuring progress should really begin at the national level where the GNP dominates. Efforts in Washington to develop ways of measuring social progress have not yet been successful, but they persist and should be encouraged. It is a difficult problem but it must be addressed by government and industry," he said.

Although Mr. Rockefeller said he is optimistic about the future, he warned, "Unless we take the initiative now, we may find we have waited until it is too late, that we are forced to act at the direction of some authoritarian figure or under pressure from revolutionary factions."

## **Plea for Better Nonprofit Management Made by Anthony**

In nonprofit organizations the top man is often a distinguished figurehead, but not necessarily a competent manager, Dr. Robert N. Anthony told members of the Boston University Master of Business Administration Association February 19.

"The boss should be the manager—the man who actually gets things done," Dr. Anthony, a Harvard Business School professor and former Assistant Secretary of Defense (Comptroller), said.

Nonprofit organizations are hampered because they cannot evaluate their effectiveness in terms of profit, he pointed out. Also there is little competition to stimulate the nonprofit organization. According to Dr. Anthony, the officers of these organizations are often political appointees, and the governing boards are largely honorary and generally weak.

Dr. Anthony believes that top management salaries in nonprofit organizations should be doubled so

that they would be commensurate with their counterparts in the business world. At the lower management levels they do match equivalent positions in the private sector.

Because of the nature of the nonprofit organization the average citizen "feels that any salary higher than his own is some sort of political plum," Dr. Anthony said. There is a great need "for greater public recognition of the management role," he concluded.

## **Modern Schools Fail To Educate Students for Work, Executive Says**

The business community must help the public education system relate more closely to the U.S. economic system, John D. Backe, president and chief executive officer of General Learning Corporation, told an audience at Massachusetts Institute of Technology's Alfred P. Sloan School of Management.

General Learning Corporation, Morristown, New Jersey, is the educational affiliate of General Electric Company and Time, Inc.

"The education environment of today is not preparing our children to go to work or to make an intelligent choice about the kind of occupation they wish to pursue," Mr. Backe declared. "As a result, the private industrial sector inherited and continues to inherit an increasing problem of high turnover and high training expense."

According to Mr. Backe, "It has always been our ideal that education would prepare our children to take their places in society, and in most cases" [that] "meant finding a job."

The public education system leaves many students "dangerously unprepared for much of anything," Mr. Backe said. He believes that some students quit school because they feel it is not relevant to the real world.

It is up to business to bring about a change in education, he asserted. "We must demand improved vocational programs in our high schools to assure better informed and trained workers for industry," he said. "Business must press for greatly expanded cooperative education, for all students, as the only way to undo the segregation of academic and non-academic students, and businessmen must get more actively involved in the instructional processes."

The programs and ideas necessary for a change in education are available, but the funds are not, Mr. Backe reports. He believes that individual and corporate taxes, which are used to support the educational system, should carry with them the right for individuals and business to have a strong voice in the system's operation and setting of objectives.

## **Small-Firm President Cites Guidelines for European Expansion**

Size should not deter a company from entering the European marketplace, James K. Sweeney, president of Computer Machinery Corporation, Los Angeles, told the American Management Association's Annual International Finance Conference. The conference was held in New York February 22 through 24.

Mr. Sweeney advised that once a company determines that it has an innovative technological advantage and that there is a significant market potential or manufacturing advantage in Europe, it should enter the foreign market.

He cited his company's experience: CMC entered Europe as a 13-month-old company with 75 employees. After two and a half years, it now has over 500 employees.

CMC originated the KeyProcessing System, a computer-controlled data entry system. Since entering

Europe, CMC manufactures, sells, and services its input equipment in England and maintains sales and service facilities in France. In the near future, it plans to enter Italy, West Germany, and the Scandinavian countries.

"Although our move into Europe was expensive it could have been more expensive—and riskier, later," Mr. Sweeney said. Research showed market conditions were favorable for CMC's entry. Also, the firm's small size provoked less concern on the part of governments and labor unions than would that of a giant firm, whose every move generates economic repercussions, Mr. Sweeney explained.

There are disadvantages to be considered before entering the European marketplace, Mr. Sweeney cautioned: first, a company's lack of experience in European ways of business, second, the immediate drain on limited capital, and, finally, variations within the European market. These variations include laws, degree of governmental involvement, monetary policies, transportation facilities, and attitudes toward work.

"CMC hires only nationals, from the head of the company on down the line," Mr. Sweeney said. "People are more effective in their environment. The subtle nuances of doing business overseas which trip up many Americans are second nature to nationals."

Mr. Sweeney cautioned against retaining overseas sales agents, however. "Whether the business goes well or poorly agents often become a problem. In case of success, the agent's contract may make it difficult for the company to establish its own sales network. If the product fails, the agent may demand the large compensatory payment that is frequently provided for in his contract," he said.

Mr. Sweeney gave some pointers for the critical period before the new operation is launched. "Adopt a low profile and blend into the business environment of the host country. Play by that country's rules," he said.



The new Electronic Document Detector scans all envelopes to ensure that all documents, checks, money orders have been extracted.

## Automatic Mail Opening, Search Equipment Said to Save Some Companies \$50,000 Yearly

Mechanical devices to automate the most prosaic of office jobs—opening and sorting incoming mail—are now being offered by a newcomer to the office machine industry, the United States Envelope Company.

U. S. Envelope, which has set up a new Mail System Division to develop and sell its Syste-Mail process, points out that American business loses millions of dollars a year because manual methods of opening mail do not ensure that all checks and payments are removed from the envelope. This causes a 90- to 150-day delay in getting payment, a thoroughly irritated customer, and untold processing and billing time for the company which misses the original payment.

The new system uses an electronic scanner which checks each discarded envelope to make quite sure all contents have been removed.

"There is no equipment competitive to the document detector," said A. Lincoln Burns, president of

United States Envelope, "and savings from a single \$15,000 machine can exceed \$50,000 a year for firms with a daily mail volume of 50,000 pieces."

Also included in the new system is a machine which opens and counts mail and one that sorts it. The sorter, which can read magnetically coded designations either inside or outside the envelope, is felt to have especially promising applications for mass solicitations for multimagazine publishers, and the manufacturers are discussing possible extension to proxy mailings.

The opener/counter works twice as fast as any competitive machine and also opens envelopes by a milling and grinding process rather than the slicer used in conventional machines, so that employees' fingers can't be cut by sharp paper edges.

The document detector, which is the most unusual unit in the system, scans discarded envelopes, after they have already been handled

manually, at the rate of 500 a minute. "It prevents the loss of checks, IBM cards, statements, stocks, bonds, and other valuable documents," said Homer Gowing, manager of the new Mail Systems Division, "while saving the large amount of correspondence and paperwork caused by such losses. An organization with heavy incoming mail volume can expect an average recovery rate of one overlooked document for each 2,000 'empty' envelopes searched."

The Internal Revenue Service is an obvious customer for devices of this type, and a document detector has already been installed at the IRS Service Center in Chamblee, Georgia.

The machines were developed by Homestead Facilities, Inc., for the Internal Revenue Service. Since United States Envelope had a much more experienced marketing organization than Homestead and was also familiar with mailroom problems, the new division has been organized under the auspices of United States Envelope to handle marketing.

## Search Firm Says Executive Job Hunting Dropped at End of '70

The last three months of 1970 showed a 17 per cent decline from the previous quarter in the number of job-hunting top and middle management executives, reports Handy Associates, a New York management consulting firm specializing in executive search.

This makes the last quarter the lowest point of executive mobility in 1970.

According to Handy's calculations, the first quarter of 1970 had 36 per cent more executives on the market than 1971 does to date. But the first quarter of 1970 had over 50 per cent more available executives than the same period of 1969.

James R. Clovis, Handy Associates vice president for executive search, feels the recent drop in the

number of job seekers might have been even more significant "were it not for a group of 'hard-core executive unemployables' arising out of cutbacks in the aerospace, defense, and electronics industries. These people are going to face tough sledding unless they can adapt their backgrounds to less specialized industries," he said.

Mr. Clovis explained that hiring plans are now proceeding after nearly a year of corporation job cutbacks or just holding the line. "They've been expecting a sudden upturn in the economy which just hasn't come as yet. Burdened with a continued soft demand, overproduction, and a limited cash flow, many of them have been forced to pare executive staffs to the bone," he said.

The executives he has observed to be most vulnerable are those who are near retirement age and whose responsibilities could be assumed by lower-paid subordinates and those in supportive services. Also research and new venture executives and the general managers of troubled companies are on shaky ground.

"The position of the general manager is somewhat of a paradox. He continues to be in extremely high demand but also is extremely vulnerable. Some firms consider him a miracle worker and unless he performs those miracles by reversing losses, he's out. There are companies that have gone through as many as four general managers in the past year," Mr. Clovis said.

## Some Data Entry Costs Could Be Cut 20-30%, Lybrand, Ross Reports

Management in many companies is overlooking opportunities for 20-30 per cent reductions in data entry costs, the March issue of the *Lybrand Newsletter* reports.

During recent Lybrand, Ross Bros. & Montgomery engagements a variety of inefficient keypunching

practices were observed. Some of these were: keypunch operators who frequently left their machines to get small, unscheduled batches of work; supervisors who were unaware of individual performance or "normal" production; formats that forced operators to search for out-of-sequence data; and insistence on a rigid policy of 100 per cent verification despite the fact that most information was noncritical.

"Computer users of all sizes may save 20 per cent to 30 per cent or more of their current keypunching costs by increasing operator productivity, reducing verification, improving scheduling, or acquiring new equipment," Lybrand says.

While manufacturers of keypunch replacements promise savings of from 10 to 50 per cent of data entry costs, an individual appraisal of a company's requirements, correlated with a detailed analysis of the critical factors, is necessary before actual efficiency gains and cost savings can be estimated, Lybrand asserts.

The *Newsletter* mentions one company that "reduced errors to one-fifth of the previous level, increased operator productivity by 25 per cent, brought back in-house work (which had been done by a service bureau), and decreased its work force *without* changing its key-tape equipment," simply by applying basic production and schedule controls and revising formats.

## Computer Terminals Will Grow Four Times by '75, Diebold Research Says

By 1975 more than four times as many computer terminals will be in use as are currently employed, a recent Diebold Research Program Study reports. Two million terminals will then be in operation.

Organizations requiring significant volumes of input data will be forced to switch from more traditional data entry devices for sev-

eral reasons, the researchers found. Large users can expect their input volume will more than double by 1975. Also, labor costs for keyboard operators and clerical personnel will increase while the cost of terminal equipment will decrease.

The Diebold researchers also point out that there will be increasing demands for higher speeds in capturing data, processing them, and obtaining responses. The development of digital networks will allow more data communications facilities to be established, and the cost of digital data communications will decrease. According to the researchers, the decreasing cost of minicomputer systems will affect the cost of terminal controllers, which will increase the potential for local processing capability.

According to the Diebold study, "Keypunch, keytape, and optical character recognition hinder the advancement of computer applications." On the average 18 per cent of the data processing budget is spent on the keypunch department, and in some cases as much as 40 per cent, the researchers state.

Three to five times the expense of keypunching is allocated to support expenses, and there is a five per cent annual increase in keypunch operating costs. The Diebold group predicts, however, that companies with small computer systems and data volume will continue to use keypunches.

Larger companies have not yet made the switch to terminals for several reasons, the study group states. These include a narrow view of costs considered for new computer applications; inadequate exploration of the problems of controlling input from remote sources; the EDP staff's inclination to propose those new systems that cause the minimum amount of disruption; and, finally, the users' indecisiveness as to what they want from their terminals.

The Diebold Research Program is a continuing study of the impact of change in management and information systems on today's decisions and planning.



The Model 85 is intended to replace a keypunch machine.

## Two Low-Cost Data Entry Units to Replace Keypunch Machines Shown by Canadian Firm

Two computer-based systems, the Model 85 and the Model 145, designed to replace keypunch machines in preparing data for processing, have recently been introduced by Consolidated Computer Ltd., Toronto.

"At \$100 and less per keyboard, the Model 85 is the lowest-price shared-processor system available and is directly competitive with keypunch costs," Jeffrey M. Donahue, head of Consolidated's U. S. operation, said.

The Model 85 is designed for high-volume operations and the

Model 145 is for remote communications tasks. They employ a mini-computer and keyboard devices to enter and edit data through an intermediate storage device to magnetic tape.

The Model 85 Key-Edit system also has a supervisor's console and a minimum of 20 keystations. The Model 145 is able to communicate over telephone lines to another similar system or directly to a central computer. It may use four to seven keystations.

## Used Computers Called World's Largest Class Of Capital Equipment

Used computers now represent the largest single class of capital equipment in the world, *All About Used Computers*, a recently released study, declares.

The study, according to the publisher, covers all aspects of the used computer, treating it as a capital goods item.

The Seventh Annual AICPA Conference on Computers will be held in Boston at the Marriott Motor Hotel May 24-26. For information, write Noel Zakin, AICPA, 666 Fifth Avenue, New York, N.Y. 10019.



According to The Boston Computer Group, Inc., computer consultants and the study's publisher, "The complex free market for used computers establishes often predictable discounts on equivalent new computer equipment still being shipped ranging from under 25 per cent to 75 per cent of new value."

The report examines potential business opportunities in the used computer market, goes into depth on how to buy and how to sell a used computer, and analyzes the projected price levels of computers by vendor, equipment model, size, and estimated future demand, The Boston Computer Group says.

The study is available from The Boston Computer Group at 15 School Street, Boston, Mass. 02108.

### Three Accounting Firms Listed in Top Ten Computer Data Sources

"List three manufacturers you would consider contacting if you were planning to buy hardware consulting," *Modern Data* recently suggested to 5,000 of its readers in a survey. While IBM was the organization most frequently listed, several CPA firms were also mentioned.

The 1970 *Brand Awareness Survey* results have just been released by Modern Data Services, Inc., Framingham, Mass., a computer market research firm. The survey is based on the replies of 1,020 *Modern Data* readers.

The hardware consultation question received 142 answers. IBM, Auerbach, Honeywell and RCA ranked first, second, and tied for third, respectively. However, tied for tenth place were Arthur Anderson, Haskins & Sells, and Price Waterhouse. Respondents also mentioned Lybrand, Ross Bros. & Montgomery, and Touche, Ross & Company.

The survey was conducted for the first time last year. This year

is the first time the tenth-place accounting firms appeared in the rankings.

Covered in the second annual survey were 54 specific types of computer hardware, software, EDP supplies, and accessories. According to Robert A. Sykes, research director of Modern Data's information products division, the most significant findings were in the product category "Computers for Business Data Processing."

Mr. Sykes points out that IBM's first place score of 32.2 per cent of the mentions in this category remained unchanged from the previous year. While Honeywell remained in second place, its percentage of total mentions dropped from 15.9 to 14.6. Univac remained in third but dropped from 12.1 per cent of the mentions to 12.0. RCA was the biggest gainer in the survey, moving from sixth to fourth place by nearly doubling its percentage of mentions, from 6.0 per cent to 11.2.

Copies of the survey are available at \$12.00 each from Modern Data Services, Inc., Information Products Division, 3 Lockland Ave., Framingham, Mass. 01701.

### Bad Questions, Outdated Programs Hamper Sampling, Consultant Says

Traditional market forecasting techniques fail because the wrong people are asked the wrong questions and outdated computer programs are used for purposes other than those for which they were originally developed, Herbert W. Davis, management consultant, said in the Drake Sheahan/Stewart Dougall Inc. March newsletter.

Mr. Davis cites the case of a turnpike which was not producing the revenues anticipated. In initial sampling truckdrivers had been asked which routes they would drive. Since the drivers follow dispatchers' orders, the routes the driv-

ers would pick had little bearing on reality, and the sample proved to be a poor forecaster.

"Firms that have had problems with judgment techniques and sampling techniques are likely to have trouble with statistical forecasting techniques, too," Mr. Davis writes. "The reason for this is that the most widely used statistical forecasting technique today is exponential smoothing, a modified moving average technique that was developed to suit the special needs of parts manufacturers and designed around the severe storage limitations of second generation computers. For all its virtues, exponential smoothing today is widely oversold as the answer to all forecasting problems."

More advanced computers and management sciences have developed newer techniques, which, when properly applied, can produce sound forecasts, Mr. Davis advised. The newer techniques include curve fitting, regression analysis, true moving averages, and time series analysis.

Mr. Davis' firm, Drake Sheahan/Stewart Dougall, has developed a proprietary statistical forecasting technique, "Curfit," which uses the least squares approach to fit a series of complex mathematical curves to historical sales data, he reports.

A three-step approach to market forecasting was used by Mr. Davis' firm for a client in the apparel field. First, early market intelligence was gathered from a balanced sample of stores, suppliers, and salesmen. Then a "barometer store" plan sampling was done to determine the buying intentions of fashion buyers in key markets. Finally, the "Curfit" statistical forecasting technique was used.

"The blending of the two forecasting techniques [marketing and statistical] has worked well for this firm," Mr. Davis writes. "The secret, of course, is a highly disciplined approach to the marketing research stages, coupled with advanced mathematical techniques in the statistical phase."

## Linowes Proposes New Funding, Measurement Program for Government Social Programs in *New York Times* Article

"To accomplish what must be done in the social sector—to produce people-oriented, individual-centered results urgently needed—we will have to create a totally new discipline: what I call Socio-Economic Management," David F. Linowes, national partner of Laventhol Krekstein Horwath & Horwath, wrote in an article that appeared in the *New York Times* March 14.

"Socio-Economic Management is a logical extension of socio-economic accounting, which can be defined as the measurement and analysis of the social and economic consequences of governmental and business actions on the public sector," he explained.

Mr. Linowes suggested that to better treat social ills funds should be allocated to programs on the basis of how well they achieve their goals. He proposed the formation of councils, composed of social scientists, accountants, and business management executives, to examine to what extent existing programs are qualitatively and quantitatively meeting their stated objectives.

The socio-economic management councils would see how well one area was handling a problem as compared to other areas of equal economic and social status. The councils would cut across disciplines and geographic areas to make these comparisons, Mr. Linowes explained in a phone conversation.

Ideally, governmental appropriations committees would rely heavily on the councils' decisions. Funds would be allocated according to comparative performance except that instead of giving the area that has been least successful in solving a problem the most money, as is now done, the area that had best worked the problem out would be awarded the largest amount. Cuts would also be made on the basis

of comparatively poor program performance.

"In business, companies watch the successful competition and copy from it: That's what would be encouraged in the public sector with socio-economic management," Mr. Linowes said. "We would be applying a market concept to the public service.

Just as in the marketplace customers have their choice, "the public sector organizations should attempt to create a choice for their clients," Mr. Linowes said. He points out the O.E.O. is trying out this approach in a few communities where children are given vouchers to enable them to attend whichever school they prefer, be it public or private. In effect, this should result in selective support of the better schools.

### **Five criteria set**

In Mr. Linowes' *Times* article he recommends that fund-granting entities for social agencies and programs apply five socio-economic management principles:

"1. Clearly identify as standards for measurement, when making fund appropriations, those objectives for which the social program or agency exists.

"2. Keep changing the mix of resource inputs—that is, the kind of things being bought with the budgeted funds—until satisfactory results are achieved.

"3. Many qualitative measurement standards already exist in the social, education, and welfare areas, but are being overlooked in assessing the results of operation of these non-business organizations. They should be used.

"4. For all social agencies and programs, identify the people who are supposed to be the recipients and develop procedures for choices by the clients.

"5. Establish a regular program

of socio-economic audits by independent outsiders."

Mr. Linowes suggests that socio-economic management councils be set up at every level of government. A problem a local council might tackle would be preparing ghetto high school dropouts for college entrance. The council would research the problem and then design a system to obtain the desired results.

### **Quantitative standards err**

Too often "the old numbers game is being played" when government applies quantitative standards to the public sector, he says. "Consider, for example, welfare programs, where allocations are mostly based on the number of people fed, clothed, and housed," Mr. Linowes writes. "Shouldn't the standards be concerned with making people self-sufficient, self-respecting, employable?"

He suggests that poverty programs apply some of their resources to setting up trade training centers. These would be operated in conjunction with government-supported, ghetto-resident-owned small industry complexes. The products turned out would be subsidized by a poverty program until the plants were running efficiently and could meet competition on their own. "The people being aided will be working for what they get," Mr. Linowes points out.

"The American accounting profession and business management—working in tandem for the first time with social scientists—have all the know-how needed to begin a 'turn around' for the public sector. Together they can create social investments that can finally begin showing desperately needed profits: improving the quality of life in the United States," Mr. Linowes concludes.

## **'Job Design' Concept Drawing More Adherents, Board Reports**

Many firms are attempting to make jobs more meaningful and challenging with job design, the Conference Board reports in a recently released study.

So far most job design has been conducted on an experimental basis with small groups of nonmanagerial employees, but the firms hope to expand the application in the future, the Conference Board states.

The basic job-design techniques the Board found being used include: job rotation, moving employees from one related task to another to broaden their perspectives and skills; job enlargement, expanding the scope of the job itself; job enrichment, making the basic task more demanding and giving the employee more planning and managerial control over the job; and work simplification, step-by-step examination of the job to eliminate unnecessary or duplicated tasks and improve methods for doing the job.

"Today's work force is indeed a new breed," Conference Board President Alexander B. Trowbridge pointed out when the study was released. "People are less easily controlled, less dependent, less submissive and passive, less willing to work 'harder and smarter' despite greater material rewards, improved working conditions, and better trained and enlightened supervision. People at work don't appear to be 'motivated,' and the carrot-and-stick formula for motivation doesn't always seem to work too well. Many managers and behavioral scientists have come to recognize that the missing element of motivation to work may lie in the character of the work itself."

Job-design techniques assume most jobs can be improved and that job content is related to job satisfaction. Job design also assumes that motivation and productivity are inextricably linked and

that man seeks and needs meaningful work, the Conference Board states.

The Board cited the structural barriers to the adoption of job-design programs: lack of sufficient skills or aptitudes for the employee to take on more demanding work; technology which cannot be radically changed; profit squeezes that cannot stand the temporary productivity dips that often accompany job changes; and union resistance or lack of interest.

There are also attitudinal barriers to job design, the Board said: implementing job design without overall organizational development; failure of management to give adequate priority to job design; lack of professional guidance to bridge the gap between theory and practice; leaving job design to supervisors and assuming that it is a routine and expected part of their job.

The author of the Conference Board study is Harold M. F. Rush, senior management research specialist at the Board.

## **New NCR System Can Produce Flow Charts**

Comprehensive flow charts are produced by a new applied computer programming system, NEATFLOW, developed by NCR for its Century Series computers.

NEATFLOW can generate flow charts on a standard NCR Century computer printer from programs written in NCR's NEAT/3 language. The charts show the functional relationship of sequential steps to be executed by program commands. NEATFLOW also produces a formatted data listing and an alphabetical reference listing.

The system flowchart describes up to eight input and eight output files for each program in the system. It also provides descriptive text for system and program explanation.

## **'Job Enrichment' — as Against Simplification — Advised For '70s**

To succeed in the 1970s organizations must more effectively utilize their human resources to achieve greater productivity and lower operating costs, Roy W. Walters, president of the consulting firm of Roy W. Walters & Associates, told the New York Chapter of the Bank Administration Institute March 12.

Mr. Walters recommends "job enrichment" because, he said, it leads to increased productivity and improved quality of performance as well as a reduction in employee turnover, absenteeism, and lateness. His consulting firm has implemented job enrichment programs at The Chase Manhattan Bank, The Bank of New York, and Bankers Trust.

[Job enrichment is the varying of assigned tasks, the opposite of job simplification.]

"By restructuring the daily tasks of hundreds of bank employees and building into their jobs greater opportunity for responsibility, achievement, and advancement, the process of job enrichment is providing motivation through the work itself. As a result, these banks are realizing increased output, improved production quality, better employee morale, and dramatic cost savings," he declared.

## **Physical Distribution Oversold in Past, Transit Group Hears**

In the '60's the concept of physical distribution was "sold without really thinking out the impact of its implementation in real, live business organizations," Ward E. Fredericks, vice president, management services, for Massey-Ferguson Inc., told a professional transportation group recently in Des Moines.

Physical distribution, the total-view approach to the transportation, handling, and storage of products, has been implemented at Massey-Ferguson but with a step-by-step approach, Mr. Fredericks reports.

Organizations are resistant to change, he points out. A distribution executive typically comes into an overlap situation with his company's marketing, manufacturing, and financial executives. "Any revolutionary approach which disrupts their control and their ability to ensure today's operation is going to meet with substantial resistance, either active or passive."

The distribution executive is also confronted with already existing accounting and information systems that were designed to serve an organization without a physical distribution department, Mr. Fredericks notes.

He suggests that the new distribution executive should apply his distribution ideas to solving a fundamental problem, either in part or as a whole. "Formulate your recommendations and put together a 'do-able' project that will take a maximum of four to six months. Sell it; then do it; and do it successfully," Mr. Fredericks suggests. Then pick another project and handle it in the same way, he advised.

## **Social Issues? Income Comes First, Say Investment Analysts**

How important to potential investors is a company's position on the major social problems of the day? Not very, the March issue of *Trends in Management/Investor Relations* reports.

*Trends*, a publication of George-son & Co., New York, collected the opinions of more than a dozen analysts on whether social responsibility had a legitimate role in security analysis and if any of their

clients had been influenced to invest or not invest on the basis of a company's social concern.

### **Little pressure reported**

"Generally speaking," *Trends* reports, "while the analysts felt that in the Seventies there was going to be greater emphasis on social programs, their primary concern was the program costs in terms of dollars and cents. They added that there had been little or no pressure on them by clients to seek out companies which were socially active. Some admitted unfavorable publicity would temper their judgment in terms of timing on a company report."

The newsletter concludes, "In other words, dollars and cents, not morality, continued to play the major role in their research activities. However, most agreed social responsibility will play a larger role in the Seventies."

Was the same once predicted for the Sixties?

## **Expansion Seen in Four Electronic Areas By IEEE Speaker**

The era of very low-cost (VLC) electronics is approaching and with it the electronic wonders predicted over the past 20 years, Dr. Arthur M. Bueche, GE vice president of research and development, declared.

Dr. Bueche made his statement to the International Convention of the Institute of Electrical and Electronics Engineers held in New York March 22-25.

"We are learning how to make fantastically sophisticated electronic components and devices, perhaps not yet with quite the ease of stamping metal or molding plastic, but with unprecedented speed and precision," Dr. Bueche told the IEEE.

He noted that over the past two decades tremendous investments in research and development have been made. "Now we are entering the decade of the payoff for these past investments," Dr. Bueche said.

VLC electronics coupled with new kinds of sensors will lead to "inexpensive little thinking machines that can sense what is going on, use their limited but sufficient logic to interpret the consequences, and then make practical decisions for continuing, stopping, or modifying the activity that originally triggered the thinking process," he predicted.

### **Four areas stressed**

Dr. Bueche forecast that industry will expand its involvement in the new electronics in four areas: combining man-amplifiers with numerically controlled machines for flexible automation; developing automobile driving safety aids; applying electronics to industries and occupations currently using little of it; and following the entire product life cycle, from manufacture to disposal.

He pointed out that sophisticated new lighting systems are already being used in factories that grow living plants. These factories also employ new sensors and specific-intelligence devices for environment sensing and new power-conditioning techniques to control light, heat, humidity, and other variables.

Dr. Bueche predicted that teaching and learning will be revolutionized by electronics within the decade. He also said electronics will be used in the home to order and stock goods and groceries, pay bills, retrieve all kinds of information, and make available entertainment to suit varying personal tastes.

"I truly believe," Dr. Bueche concluded, "that if we redirect our technologies—and our attitudes toward the use of technologies—in the proper way, the new electronics revolution based on VLC can vastly increase freedom of choice for people everywhere."

## Honeywell Introduces Six Large-Scale EDP Systems

Six large-scale data processing systems, the Series 6000, have been introduced by Honeywell Information Systems.

The Models 6040, 6060, and 6080 are specifically designed for data processing tasks that make heavy use of COBOL programs for business-oriented applications. The Models 6030, 6050, and 6070 are designed for mixed scientific/engineering and business work and are priced at a lower monthly rental rate.

Included in the Models 6040, 6060, and 6080 is a built-in Extended Instruction Set (EIS), which provides several times the processor speed found in the simpler models of the 6000 line for business-oriented applications such as inventory control, payroll, accounts receivable, accounts payable, and general ledger processing, Honeywell reports. EIS minimizes the amount of memory required for programs, Honeywell says, and thus increases multiprogramming depth.

Remote and local batch processing, time sharing, remote access and transaction processing, all using the same data base of information, can be processed concurrently on all six models to maximize the use of systems and resources, Honeywell says.

The Series 6000 represents a first venture in the top end of the computer market for Honeywell. "One of the principal reasons for our merger last fall with General Electric was to increase our resources to serve the large-scale segment of the computer market on a worldwide basis," C. W. Spangle, executive vice president of Honeywell, said. The merger was completed October 1, 1970 (see M/S, July-Aug. '70, p. 12).

Lease prices for the Series 6000 range from \$21,200 per month for a typical Model 6030 to more than

\$162,500 per month for a large multiprocessor Model 6080. Purchase prices range from \$1,000,000 to more than \$4,500,000.

The Models 6030, 6050, and 6070 will be ready for delivery in July while the 6040, 6060, and 6080 will be available in the second quarter of 1972.

## General Electric Opens Data Communications Products Department

When General Electric merged its computer operations with Honeywell last year (see M/S July-August '70, p. 12) it initially appeared to be moving out of the EDP field. However initial impressions are often deceiving and it was soon learned that GE would maintain—and even expand—its time sharing operations. Now GE has announced the establishment of a new Data Communications Products Department.

### *Total systems planned*

"The new department will be able to provide total systems design for collecting, moving, and accessing data over a network optimized to meet individual customer needs," GE states.

GE's new department will have total responsibility for the Terminus 300 data teleprinter products and the DigiNet product lines, which include data modems, couplers, multiplexers, and concentrators.

Richard P. Gifford, general manager of the Communications Systems Division, said, "This consolidation of the division's data communications capabilities will allow a more concerted thrust into the numerous opportunities now developing in the access to, or movement of, business information, including daily business transactions and mail."

## IBM Replies to RCA Challenge with New Medium-Size Computer

IBM has introduced a new medium-size computer, the System/370 Model 135, that it says is up to four and a half times faster internally than its earlier System/360 Model 30. The new computer also has nearly four times its predecessor's memory capacity, IBM reports.

Late last year (see M/S, Nov.-Dec. '71, p. 16) RCA announced the RCA 2, a computer which it claimed had "three times the processing power" of the IBM System/360 Model 30. At that time RCA also announced its new marketing programs were aimed directly at IBM's customers.

"Computer users moving into advanced data base and teleprocessing applications will find the Model 135's combination of large data capacity, high performance, and low-cost communications features ideal for their needs," said Ralph A. Pfeiffer, Jr., IBM vice president and Data Processing Division president.

### *MIS possibilities*

"A bank with branches or a manufacturing firm that has remote plants, for example, can expand to a management information network with the Model 135 more economically than ever before," he maintained.

Main memory sizes for the Model 135 range from 96,000 to 240,000 characters of data. The memory uses monolithic integrated circuits rather than the more conventional magnetic cores. This results in a faster and more compact memory, IBM claims.

Monthly rental for typical configurations of Model 135 will range from \$9,870 to \$22,600. Purchase prices will range from \$475,000 to \$1,068,000. First customer shipments are scheduled to begin in May, 1972.

## Weekly Payroll System Announced for Use With Philips Unit

Philips Business Systems, Inc., has introduced a weekly automatic payroll system for use with its P-353 business-oriented minicomputer.

Up to seven categories of taxes and as many as nine types of fixed deductions can be calculated automatically for each employee, Philips claims. The payroll system generates completed checks, itemized stubs, payroll journal entries, and updated employee earnings records. It also makes out required 941A and W-2 forms.

"The program can be of great benefit to middle-size businesses and decentralized departments plagued by a scarcity of trained personnel and constantly rising administrative overhead costs," Arthur L. Hanrahan, president of Philips, said.

The payroll system is available at a lease cost of \$20 per month. Depending on selected options, the P-353 office computer leases for \$300 to \$400 per month and sells for \$14,990 to \$22,990.

## Direct Delivery System For Retail Store Accounting Developed

A new system of direct delivery accounting for retail-level store operations has been developed by the MSI Data Corporation, Montclair, California, for use with its MSI-100 Electronic Ordering System.

According to MSI, the system collects and processes information on merchandise shipped and billed at the store level and eliminates the task of matching store and vendor invoices by hand.

Each retailer pays according to his receipts, MSI explains. The vendor may then choose not to send

statements and audit by exception. This practice provides the vendor with a means of controlling driver theft, MSI points out.

Using MSI's system, the individual store transcribes data from standard format delivery forms to the MSI-100 daily. The information is then transmitted to the data processing department, where it is processed through an edit run and compared against the actual delivery forms, referenced on an exception basis only, to resolve invalid entries and discrepancies. Weekly a list of unresolved discrepancies is prepared. The remaining valid data is processed through the regular general accounts payable balance forward file, MSI says.

Several lists are produced by the MSI-100 which are updated weekly. These include item master file lists, store master file lists, vendor master file lists, and current vendor allowance and discount lists, the company says. MSI claims the system is adaptable to any retail-level operation involving the movement of merchandise.

## IBM Builds New Model With Old Computer Parts

A new computer model has been added to IBM's relatively old 360 line. Portions of the new Model 22 are reconditioned elements of earlier models.

IBM calls the Model 22 "a general purpose computer that combines intermediate-scale data processing capabilities with small-system economy." It operates under IBM's Disk Operating System.

The Model 22 is available in two main-storage sizes, 24,576 bytes and 32,768 bytes. One byte can be placed or retrieved from main storage in 1.5 microseconds, IBM reports.

Typical monthly rental for a Model 22 with 24,576 bytes of main storage is about \$5,600, and the



Many Chicago area banks are installing this simple TRW computer system by which tellers flashing a central office get an immediate signal showing whether there are sufficient funds to cover a check.

purchase price is about \$246,000. First scheduled customer delivery is in July.

Since June IBM has introduced four models in its System/370 line. This line promises users quicker processing, but purchase prices start at about \$475,000.

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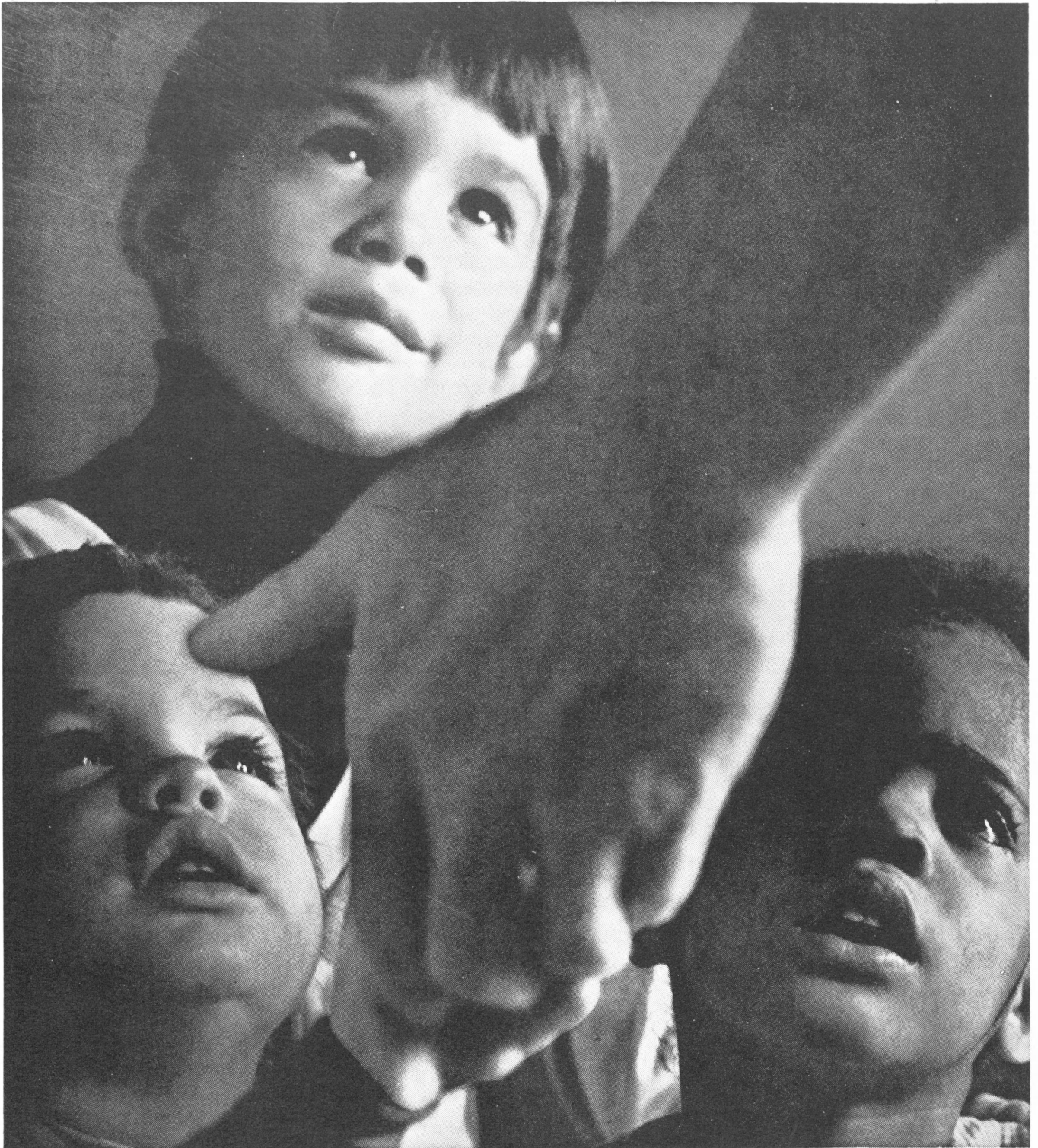
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*There are measures, entirely within the control of business, that could ease two of our most pressing social problems without government programs or vast expenditures —*

## **A BUSINESS SOLUTION TO OVERCROWDING AND INFLATION**

*by Reuben W. Abrams*

*Laventhol Krekstein Horwath & Horwath*

**M**AKING the best use of our resources might seem to deserve but little attention. Yet it could well be the key to the solution to some of our most pressing and perplexing problems.

As it happens, the use of existing resources lies within the power of management. Requiring neither government sponsorship nor official intervention, plans for improving the productivity of equipment can be adopted and implemented by individual companies.

Those industries that follow this route will benefit, of course. And they will also be taking the most effective action to combat both inflation and overcrowding, as we

shall see. Improved use of equipment is not a problem at all; it is an opportunity to harness an enterprise to the public good.

Inflation is more than just a problem of the moment. Even if the present policies of the Nixon Administration and the Federal Reserve succeed in slowing the steady rise in prices for a while, there are likely to be more bouts with inflation in the years to come. Because future policies are likely to be adapted from present ones, it will help to examine some basic concepts in vogue.

Considerable reliance is placed on monetary policy. A combination of tight credit and high interest

rates has been the chief ingredient in the prescription for bringing inflation under control. Without examining in detail the mechanics by which monetary policy can operate to restrain the economy, we may make a few pertinent observations.

Restrictive monetary policies tend to hold back investment in new plant and equipment. High interest rates and difficulty in raising funds are expected to act as depressants, although the evidence on this score must be regarded as inconclusive.

Whether or not tight money is directly operative in reducing capital expenditures, it is certainly a



strong indirect factor. For tight money does affect consumer demand, which in turn casts a pall over plans for industrial expansion. One way or another, then, this monetary policy does slow both the rate of economic growth and the rise in price levels.

Unfortunately, reduced consumer demand produces unwelcome results along with the desired effect of a slowdown in the economy. Unemployment, which in itself is undesirable, must be looked upon as a necessary evil when tight money is the means selected to combat inflation. Whether unemployment is merely a concomitant of the slowdown or a link in the chain of cause and effect matters little to monetary theory. High rates of unemployment are inevitable.

Unemployment is a short-run effect of tight money; and it is necessary for us to have faith that employment trends can be reversed once inflationary pressures show signs of abatement. This may happen some time before inflation itself is noticeably reduced; so that rather difficult timing decisions are involved.

More dangerous than the short-run effect is the possibility that, over a longer period, tight money policies designed to defeat inflation may defeat their own objective instead. Put in its simplest terms, the argument here is that failure to replace worn-out and obsolete equipment and to enlarge manufacturing capacity will restrict output later on, so that fewer goods will be available for consumers' dollars to buy. Thus the inflationary aspects of hobbled pro-

ductivity come back to impede future efforts at stabilizing prices.

The most disturbing thing about the two dilemmas is that they operate independently: We may endure the hardships of unemployment over the short run only to suffer worse inflation in the long run. There is a depressing prospect, in other words, that we will find ourselves losing both ways.

### *Sources of inflation*

There are deep reasons why inflation is so stubborn now and why it threatens to remain a problem far down the road. The causes are rooted in sociological factors at work in the world at large.

One source of inflationary pressure is the urgent desire of minority groups to share in the affluence they see in other segments of society. When a sizable number of people find that an intolerable earnings gap separates their life style from the life style of others, if their demands for more equitable treatment are satisfied, there is bound to be a strain on the economy.

Rising standards in one group, the poor, can only come from two sources: increased gross national product or redistribution of income—a larger pie or changes in the way it is sliced. For years, national economic policies went in pursuit of the larger pie, but the growth rate was not sufficient to carry all the demands made on our production (including a war, a space program, urban renewal, and anti-poverty projects). Redistribution of income by raising taxes was not attempted in time. The economy then effected its own redistribution of wealth through inflation, which favors the borrowers and the poor (greater employment of marginal labor and cheaper repayment of debt are boons to them) at the expense of the lenders and those on fixed incomes (notably the retired).

The recent swing toward restrictive monetary policy—even though it is now being reversed—

tends to hold back economic growth, so that further minority group demands for improved living standards will have to be directed at redistribution of incomes; the pie will simply not be growing as fast as it did in the Sixties. This creates a bleak outlook.

Any redistribution of income runs into heavy opposition from other quarters. Blue-collar workers, for example, have become quite vociferous in their insistence that their position must be secure and improving. And they are not alone. The beneficiaries of past economic growth, and especially the pensioners, view with alarm any threat of a setback to themselves.

Meanwhile there is a backlog of things to be done, and this backlog continues to grow. Urban renewal requires enormous expenditures. These projects would improve the lot of many Blacks and other minorities; so there is an overlap between urban renewal and economic opportunities for the disadvantaged. By the same token, there is an urgency attaching to urban renewal.

Improvement of mass transportation has suffered many delays. A source of considerable discontent already, it threatens to grow worse unless a tremendous effort is forthcoming to revitalize our commuter and inter-city transportation systems. This effort will be expensive.

The public has only recently begun to take to heart the warnings of ecologists that we are polluting the land, the sea, and the air at a rate that can only lead to catastrophe. Whether the effort to clean up is made by industry, local authorities, or the Federal Government, it will have to be paid for, and it will be costly.

In assessing the fresh outlays that will be required to revive the cities, unsnarl the traffic jams, and clean up our planet, we cannot count on transfers of resources from other areas. True, there have been large budgets for space and defense, and space outlays are dropping. But defense expenditures



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## To use our resources better, we propose staggering work days and adding work shifts

will continue to be large, even if the war in Indochina can be ended soon and international tensions are eased as far as we can reasonably hope.

Where, then, can we turn for a solution to the problem of inflation? Obviously no single answer will suffice. It is likely that, at some point, fiscal policy will be tightened: that taxes will go higher and budgets in the public sector will be trimmed as far as possible. In the private sector, both business and labor will be asked to exercise restraint in seeking increases in prices or wages.

Another factor may also help to contain inflation. The worldwide need for capital to finance the development of industry will grow at an accelerated pace. Here at home, power requirements alone will force the utilities to seek huge amounts of money. Other developed countries will also step up their consumption of power. Then there are the underdeveloped countries, which cannot possibly accumulate capital fast enough to support the growth they desire.

This need for ever-increasing sums of money will tend to keep interest rates fairly high. Interest rates are driven up by the natural forces of supply and demand operating in capital markets around the world. To the extent that a return to high interest may serve as an inducement to people to augment their savings, the effect of all this predictable need for financing will be deflationary even though high interest rates also tend to raise the price of goods.

Still, there is a compelling need to look for a new and imaginative solution to the problem of inflation, and the preferred characteristics of such a solution can be readily limned out:

- It should require little or no investment of capital.

- It should increase the productivity of resources (either manpower or machines).

- It should increase total production of goods and services for consumers.

The reason for seeking a solution that requires no investment of capital is simply to avoid the immediate diversion of productive effort to nonconsumer items. Payrolls of machinery manufacturers tend to swell the sum of money chasing after consumer goods in short supply. So, for the short-range effect, it is useful to avoid expenditures.

Over the long term, equipment will be used up faster, to be replaced earlier by more modern equipment, with effects that we will discuss later on.

Higher productivity of either labor or machines (machines represent stored labor, a form of capital, among other things) is the ultimate answer to inflationary pressures. It is therefore an important long-range consideration that productivity continue to improve.

A solution that entails gains in productivity tends also to remove the rationale for artificially creating unemployment. For in the last analysis the reliance on unemployment to combat inflation must rest on one of two assumptions:

- that those who lose their jobs were not productive enough; or

- that the threat of unemployment will goad the employed group to work harder or for lower wages.

If these two assumptions are true, and if they actually cause more output to come from fewer people, then unemployment can be accompanied by gains in productivity adequate to combat inflation. However, the risk involved in pursuing a policy of unemployment for a long time is just too great to be worth taking.

Increased total production of

goods and services for consumers is a natural result of increased productivity of existing equipment without additional investment in capital goods.

This, then, is the objective: more goods and services available to consumers to reduce the inflationary pressures caused by the classical situation of too many dollars chasing too few goods. If we can achieve this goal, we may have found the answer we seek.

We have established criteria for escaping the dilemmas that inhere in current anti-inflation policies. Solutions that meet our criteria must obviously make better use of existing plant and equipment.

We will discuss two ways for industry to accomplish this objective: by staggering work days and by adding work shifts. But first let us look at the economy as a whole and the use we make of facilities not directly related to industrial production. For the quality of living, the life style of individuals, is clearly affected by the use of educational and recreational plant, regardless of whether that use is included in calculations of the gross national product. Indeed, a major thrust of our argument is in the direction of better employment of nonmanufacturing plant.

To begin with the simplest of situations, we propose to keep schools open twelve months of the year instead of nine. Students—and teachers, of course—would divide into four groups, each taking off one month in four. These vacation months would be staggered, so that group A would take January, May, and September; group B February, June, and October; group C March, July, and November; and group D April, August, and December. This plan increases the capacity of our schools by one-third, at a time when overcrowding prevails in many school systems.

Schools in many parts of the country would require air conditioning, but this is already being done in many new schools under construction and in any case would not be an impossible alteration job. It would certainly be simpler and cheaper than building new schools in areas that are now overcrowded.

The plan does more than increase capacity. It benefits parents by permitting them to schedule their own vacations outside the summer months. Air conditioning at home and at work have made summertime both more productive (from an employer's standpoint) and more tolerable for staying on the job (from a worker's standpoint).

In addition, air travel makes vacations desirable in any season. There is always a place to go, and a way to get there, as so many tourists have been finding out. And for those who, for whatever reason, don't choose to fly, resort areas, including ski areas, have become more accessible by car or train.

Perhaps the greatest boon is to the hospitality and transportation industries; for the plan allows them to make better use of their assets by spreading the demand over a longer season. In many cases, over the entire year. Some resorts wouldn't do any better than they do now; it's doubtful if Nova Scotia will ever be a popular winter resort. But Florida has shown that traditional winter resorts can do all right in the summertime too; and one of the most popular winter activities is skiing, so resorts in New England, the Rockies, and the Laurentians could fare very well under the work schedule we propose.

This is precisely the kind of advantage we are looking for. When hotels, motels, and recreation areas can remain open to receive guests throughout the year, the gain is not theirs alone: Their guests suffer less from seasonal crowding, and the economy gains from fuller use of resources. This is equally true for airlines, cruise ships, buses, trains, and even highways. In fact, it holds true for every business associated with tourism in any way.

We have mentioned that industry has more than one way to increase the employment of its equipment. Let us turn to staggered work days as the first method.

The customary work week is now five days, Monday through Friday, with plants shutting down for the weekend. It was not always this way. People have worked longer weeks; they have worked on Saturdays and Sundays (and still do).

The list of activities that operate on Sunday is imposing. It includes heavy industry, textiles, retailers, hospitality, health care, entertainment, transportation, military, police, fire, and emergency services. On occasion, many more industries carry their overtime work into Sunday. All in all, there seems to be little resistance toward Sunday work, especially when it is accompanied by a day off during the week.

### *Three work groups*

Our proposal is to break from the calendar week and set up three rotating groups to work four days on and two off (or six on and three off). It might even be desirable to alternate: 4-and-2 for eighteen weeks, followed by 6-and-3 for the next eighteen weeks or longer. Over a complete cycle of six weeks, three groups working 4 on and 2 off would be scheduled as shown in Exhibit 1, page 25.

Overlapping would serve to maintain a continuity in operating and in disseminating information. Each group would have its own supervisors in order to establish normal working relationships.

This would work for most companies, not for all. Obviously, a concern where all workers would be needed at the same time couldn't function this way. Nor could a concern where managerial personnel have to be on hand at all times that workers are functioning. On the other hand, our schedule wouldn't by any means be restricted to factory-type work environments. Wherever work is of a routine nature, and supervisory levels are

adequately staffed, it could be done. A large insurance company—of which so many are already on staggered hourly work shifts—could institute it with comparatively little trouble. So could a bank. A small advertising agency or firm of CPAs, granted, could not—at least until its clients were on a staggered schedule themselves.

The groups we are talking about would all work the same shift (perhaps 9 a.m. to 5 p.m.). We will turn to a discussion of shifts later. For now, it is enough to say that each shift would have three work groups.

Each holiday could be celebrated on three alternate days within a week, in order to avoid plant shutdowns. Each group simply celebrates on one of its off days. (It might be objected that this does away with holidays; and we may point out that workers will still have more days off, while machinery doesn't care.)

Two kinds of holiday cause special problems; religious holidays and Election Day. For religious holidays that must be celebrated on a specific day and no other, individuals could arrange to switch days with non-observers in most metropolitan centers where there is a mix of religious groups. Election Day should not be part of a weekend pattern, lest voters be encouraged to leave town and neglect their civic duty. On this one day, it would be better to bring in all three groups for half a day and to operate at 75 per cent of normal.

On its face, this is a proposal for a shortened work week, and most inappropriate for an era whose major concern is inflation. In fact, proposals for four-day weeks (with three days off) were being advanced a while back, and they are probably now awaiting a more favorable climate of opinion before they blossom forth again. (An increasing number of companies are quietly using a four-day, ten-hour-day work week right now.)

But this superficial view is not the last word, as a few simple calculations will demonstrate. A typi-

EXHIBIT I

Week	Group	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
1	A	X	X	X	X	O	O	X
	B	X	X	O	O	X	X	X
	C	O	O	X	X	X	X	O
2	A	X	X	X	O	O	X	X
	B	X	O	O	X	X	X	X
	C	O	X	X	X	X	O	O
3	A	X	X	O	O	X	X	X
	B	O	O	X	X	X	X	O
	C	X	X	X	X	O	O	X
4	A	X	O	O	X	X	X	X
	B	O	X	X	X	X	O	O
	C	X	X	X	O	O	X	X
5	A	O	O	X	X	X	X	O
	B	X	X	X	X	O	O	X
	C	X	X	O	O	X	X	X
6	A	O	X	X	X	X	O	O
	B	X	X	X	O	O	X	X
	C	X	O	O	X	X	X	X

cal working year is now 242 days, allowing 52 weekends, 9 holidays, and 10 vacation days. Our plan could allow 12 vacation days and still call for 231 working days, a drop of 4½ per cent. The work force would put in 11 fewer days.

On the other hand, a plant that now operates 242 days (allowing for a two-week vacation shutdown) or 252 days (with no vacation shutdown) would run either 353 days (with a twelve-day vacation shutdown) or 365 days (with no vacation shutdown), a gain of 111 to 113 days, or about 45 per cent.

There can be no question that the gain in machine output would exceed by far the loss of a few days' output from workers. We can actually eat our cake and have it too. We can have more leisure time while meeting increased demand with existing facilities.

As an anti-inflationary force, this advantage is strengthened by another one. With less call for capital goods, and less of the workforce engaged in manufacturing capital goods, there will be more consumer goods for people to spend their available dollars on.

Now consider the boon that this plan bestows on the hospitality, recreation, entertainment, and trans-

portation industries and their customers. By ending the sharp dichotomy between weekdays and weekends, the plans spreads out over seven days the use of all kinds of equipment. A restaurant in a business district will have seven operating days instead of five, and a restaurant at a weekend resort will have seven operating days instead of two. Even hotels that cater to both commercial travelers and tourists will be relieved to see their chronic weekend imbalance come to an end.

Transportation (including highways again) would gain an extra benefit from the fact that two-day, and perhaps three-day, rest periods would overlap for people in different companies, so that every day would find one group going off and another group coming back.

It must be recognized that this plan for staggered work days is primarily applicable to those industries with little or no seasonal variation. On this score, let us note two things in passing: First, pressures for a guaranteed annual wage will provide seasonal industries with an incentive to find ways for leveling production economically. Second, the plan for staggered school vacations, discussed earlier,

would tend to eliminate some seasonal factors, like a "back-to-school season" and a summer "vacation season."

Twenty-four-hour operation is not so uncommon as to startle people. Plants have been working on three shifts for a long time. In some industries, that is the entrenched tradition. Especially where shutting down or starting up involves costly procedures, as in steel mills.

Nor is the staggering of hours of work altogether new. On a small scale, it is practiced wherever some employees report in earlier or later than others. On a large scale, it has been tried voluntarily by employers in major cities who adjust their working hours to avoid the morning and evening rush.

We advocate two things:

- Extension of staggered working hours to achieve complete leveling of requirements for transportation and meals.

- Extension of round-the-clock operation until it becomes the norm (as indeed it is now in Las Vegas) whenever a factory or office has so much business that a new facility or expansion seems indicated. Instead, under our plan, the present facility would go on round-the-

## But a moment's reflection will show inner city streets are unsafe at night . . .

clock operation each working day.

Round-the-clock operation is made practicable by modern lighting and air conditioning, which have brought sealed buildings, even windowless buildings, in which the climate is completely regulated. To those working in such a building, it matters not at all whether the sun is shining outside. Indeed, for those who prefer their recreation to be outdoors in daylight (golfers, for example), night work can be more desirable than day work.

There will be an immediate reaction to this suggestion: Employees won't come to the inner city at night. But a moment's reflection will show that inner city streets are unsafe at night because they are lonely; once they are populated they lose their danger. If enough people are going to work at midnight, it's no longer perilous to be out at midnight.

Once people become accustomed to the fact that businesses operate 24 hours a day, the limitations on staggering of hours disappear. A shift can then begin at 11 a.m. as readily as at 9 a.m., at 2 p.m. as readily as at 4 p.m., which is when many people now report to work. So hours can be staggered around the clock, even down to half-hours, with shifts starting at 11:30 and 7:30, morning or night.

That multiple shifts and staggered hours would relieve the commuting problem of our cities is obvious. That this solution would be inexpensive is also clear. Present facilities could easily handle the traffic in and out of cities if rush-hour peaks were removed.

The commuter himself would benefit in several ways: His trip would be faster, and it would cost him less. The commuter train now has two peak periods during the day—at morning and night. It returns to its source deadhead after

the morning rush, to make a few more runs half-empty during the day. Under the scheme we propose, much shorter trains could make the run in in the morning to return with a full load of those going off duty. And the trains that now run in the "off-hours" could carry a full pay load. In addition, the commuter would find transportation available at any hour of the day or night that he chose to go into town for any reason.

At mealtime, too, people would benefit from far less crowded conditions. And restaurateurs could serve cheaper meals, because they would be making better use of their equipment. With no more peak periods to contend with, restaurants could eliminate split shifts and other sources of discontent among personnel.

Put simply, our proposal amounts to keeping people out of each other's way. For if we do that, we may find that the planet is not so severely overpopulated after all and that we can lead better lives even as the score stands now.

Merely to depict the favorable aspects of round-the-clock operation, genuine as they are, would not be enough. There are long-standing objections to be reckoned with. Objections that are not so much time-honored as old and tired.

There are lingering prejudices from earlier times when more people were superstitious about witching hours and midnight fantasies. (Midnight fantasies in some cities are today not always fantasies, we concede. But we repeat what we said before. The dangerous street is an empty street. If the crush of people that jams streets at noon were spread out over twenty-four hours, if shops and bars and restaurants were open around the clock, who would hesitate to go at any hour?). With better lighting,

and perhaps in part because of urbanization, many people travel at night by choice: to visit friends, to seek entertainment, or to avoid traffic jams in the early evening. These same traffic jams just have been known to continue far into the night, especially on holiday weekends, making involuntary night owls of people with more conservative inclinations.

In any case, whether by free choice or under pressure of circumstances, people do keep later hours. They have little remaining reason to regard nighttime activity as a novelty or an aberration. Projecting long-term trends into the future, we can foresee twenty-four-hour-a-day living as the accepted mode. When that time comes, there may no longer be a late-late-late show on television, nor an early bird show. The same shows could be there, but their names would designate recognizable characteristics in a society that no longer thinks in terms of 3 a.m. as "late" and 6 a.m. as "early."

In that society all advantages of a particular shift will have disappeared. There will no longer be a "prime time" for selling by television. With audiences available at all hours, programming will have no peak periods to pursue. City streets and parks will be safer at all hours, too. In New York City, a program has already been inaugurated to reclaim Central Park for law-abiding citizens by providing popular and cultural entertainment late at night.

The breakdown of the day shift mystique is well demonstrated by the changed attitudes of office workers. Whereas they might have been expected to hold out indefinitely against night shifts, they have instead accepted the concept of continuous data processing to make full use of the potential of the computer. Data processing cen-

**... because they are lonely; once they are populated, they lose their danger**

ters now regularly offer round-the-clock service.

Improved long-distance communication and worldwide communication, fostered by increased international trade and international companies, provide a subtle, natural stimulus for putting to rest the prejudices of the segmented day. Should you want to call someone in London at 10 a.m. (his time) and you are in Los Angeles, you will have to make your call at 2 a.m. If you want to put through a trade in time for the opening of the New York Stock Exchange and you are in Hawaii or New Zealand or Israel, you will have to adjust to the realities of time zone differentials. As the world grows smaller, these time differences cease to be a source of wonderment or annoyance; an awareness of the relative nature of time becomes part of the intellectual environment in which we live.

Our combined proposals call for three groups working on staggered daily schedules within each of three shifts working on staggered hourly schedules, a total of nine work crews that would keep equipment running around the clock and through the week.

When equipment is used twenty-four hours a day, seven days a week, by nine different crews, the need for preventive maintenance is intensified: Neglect will bring on repeated breakdowns that would destroy the effectiveness of the whole program to increase productivity. It is necessary to schedule some idle time for every piece of equipment in order to give the maintenance men a chance to keep it operational.

There are several ways to schedule maintenance work under conditions of continuous operation. One daily shift may be deliberately understaffed and its people rotated while equipment is made idle for

regular maintenance. Whole departments on all shifts may go on vacation while their machines are overhauled. In either case, the problem is not insurmountable.

Another type of question arises in connection with heavy use of equipment. Regardless of accounting methods, which may or may not reflect faster depreciation on a company's books, equipment does wear out faster when it is used more. Are the lower production costs of additional shifts illusory, then?

The answer is no. Much machinery is scrapped before its capacity to produce has been exhausted. This loss of productive capacity through obsolescence would be sharply curtailed by concentrated use over shorter periods.

Some old equipment, while less efficient than newer models, continues to operate because its competitive disadvantage has not reached a critical point. Intensive use of this kind of equipment, resulting in more frequent replacement of worn-out items, would mean that production came from equipment of more modern design. Thus, heavier use of a company's machinery can be an important factor in continually improving its efficiency.

There is yet another advantage accruing to the company that uses up the productive capacity of its plant quickly. Looked at from a financial standpoint, such a company is recovering its investment faster, which means that the total cost of carrying the investment over its life—the total cost of interest, real or imputed, that is—will be lower; the return on investment will therefore be better. In annual financial statements, this advantage shows up as a lower interest cost per unit of production (and sales).

At a time when problems of

great difficulty and enormous consequence threaten the nation's well-being, a solution to two sets of major problems should not be allowed to wait for implementation by later generations. The solutions we have proposed here, we believe, will one day be adopted. Their peculiar aptness for our time should make their adoption a matter of urgency for decision makers now.

The problems we are attacking are inflation and overcrowding. There is no need to describe their seriousness; much less reason to exaggerate their importance. Under the circumstances, solutions much more radical than ours could deserve consideration.

What we are proposing is really only a matter of freeing the nation from the bonds of an outmoded, tyrannical calendar week of seven days, of seizing the opportunities afforded by our newly won ability to control indoor climate, and of recognizing the meaning of extensive, rapid travel and communication. In these days of sweeping changes, our proposal is moderate indeed.

To summarize, we advocate these changes:

- Staggered school vacations to increase by one-third the capacity of schools and to contribute toward the damping of seasonal fluctuations in the economy
- Staggered work days to increase plant capacity by 45 per cent and to level the weekend peaks suffered by the hospitality and transportation industries and their customers
- Round-the-clock business activity and staggered shifts to multiply capacity by a factor greater than two and to level the rush-hour peaks suffered by commuters, people eating out, and the transportation and restaurant facilities that serve them.

*The checklist is actually a shortcut to problem solution, serving to ensure that no necessary steps have been overlooked. As such it can be useful in a wide variety of business situations —*

## **CHECKLISTS IN PROBLEM SOLVING**

*by John J. Mariotti*

*General Motors Institute*

**I**N DEVELOPING structured approaches to problem solution, problems can be broken down into sub-problems, which in turn can be solved by taking a series of identifiable steps. The steps appear in checklists which have proved useful in specific cases. The lists may represent a consensus of planners on the important steps in solving particular types of problems. They assure the user that most relevant factors have been considered and all necessary actions have been tak-

en. Checklists usually state what the planner should do—they do not specify how he should do it or why. The lists do not necessarily indicate relationships or priorities among steps, nor do they deal with specific analytic methods or basic concepts.<sup>1</sup>

Checklists can be found every-

where. They are widely used in textbooks, in reference works, and in professional, trade, and governmental publications. We see checklists used by lawyers, doctors, and engineers. Example 1 on page 29 is a checklist used by the author in the study of office methods. Figure 1, page 30, is a chart of the paper flow for a tool checkout procedure while Example 2, page 31, is the checklist used by the analyst in developing the chart. Rarely is a problem of any size solved without

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<sup>1</sup> Eagle, Alan, "A Spectrum of Analytical Approaches and Their Fields of Application to Planning," Stanford Research Institute, Stanford, California, 1965.

the aid of one or more checklists. Most of us have been pressed into grocery shopping by our wives, who may have lightened our burden by presenting us with a checklist.

### **Nature of a checklist**

What is a checklist? It has been described as an analytical framework,<sup>2</sup> an attempt to ensure that everything will be taken into account that should be taken into account before reaching a decision.

Can one ensure that all the factors which could influence a problem are included in a checklist? While the total number of factors that could influence a problem is probably finite, they are unlistable and unmanageable. However, even though the checklist cannot be a complete mapping of the factors, it serves an excellent purpose—it provokes thought and saves time by giving one a basis for analyzing one's own situation. Checklists are easily understood and can be used by relatively inexperienced people.

### **Dangers**

An inherent danger is that they have an aura of directness and completeness. One is tempted to place too much faith in their completeness. However, let us consider a specific problem such as developing a checklist for use in buying groceries. What is the purpose of the list? Are there musts? Are there wants? Who will fill it out? (Housewife, husband, children, maid—all this affects language used and format.) How often? Under what conditions? Can one checklist fit all anticipated uses? Can one checklist facilitate use by both the housewife (planner) and the husband (buyer)? What other ways are there? Are they better? Is there a standard checklist available? It is apparent that we are developing a checklist which can be used as an aid in the design of checklists.

In the typical home situation, the

## EXAMPLE I

### Office Methods Analysis Checklist

1. Volume.
  - a. The number of logical records in the file. All information concerning its history.
  - b. The number of documents processed in a significant operation.
    - (1) The average number over a given period of time sufficiently long to include at least one full cycle where applicable.
    - (2) The peak number during a cycle and when it occurs.
    - (3) The peak number during a cycle normal period.
  - c. Messages, triggers, and other data media (same information required as in 1b).
2. Estimated time required to perform the operation.
  - a. Set-up time.
  - b. Elapsed time average.
  - c. Elapsed time maximum.
  - d. Elapsed time minimum.
3. Skill or job code required to perform an operation (typist, hourly clerk).
4. Handling urgency.
  - a. Dispatch required in performing operation (posting must be done by 4:00 p.m.).
  - b. Priority or ordering of eligibles for the operation.
5. Retention in file—the duration a document or record is held in a file, a file being any significant accumulation of the documents or records even if only for a portion of the day.
6. Sequence—internal ordering of a file (alphabetic by vendor name, chronological, part number).
7. Media—form the record takes (telephone message, paper form or tag, magnetic tape, punch card).
8. Method of entering information (tools and equipment):
  - a. Keyboard (typewriter).
  - b. Handwritten.
  - c. Voice (telephone).
9. Form number and names.
10. Number of copies involved in operation.
11. Approximate number of digits or characters added or referenced in an operation detailed by components such as—Description—13 characters, Quantity—8 characters.
12. Reliability.
  - a. Likelihood of errors and their nature.
  - b. Checks and audits designated to eliminate errors.
13. Brief explanation of reason for performing operation.
14. General comments.
  - a. Exceptions—description of and frequency.
  - b. Complaints of individuals performing operation.
  - c. When form comes into a department from many departments, show all sources.

<sup>2</sup> *Ibid.*

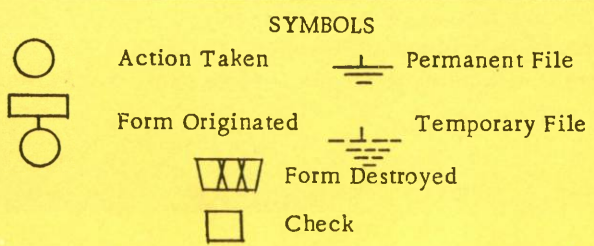


FIGURE 1

ROUTINE SEQUENCE CHART

TITLE Tool Check-Out Procedure OBSERVER Jones DATE \_\_\_\_\_  
 (Three-Slip Method)

STEP NO.	PLACES OF PERFORMANCE									EXPLANATION
	OPERATOR	FOREMAN	TOOL CRIB ATT.	TOOL CRIB RECORD SECT.						
1		S <sub>1</sub> S <sub>2</sub>								When operator needs tool from Tool Crib.
2	S <sub>3</sub>									Checks slip for accuracy and completeness and if O. K. approves.
3		S <sub>2</sub> S <sub>3</sub> S <sub>1</sub>								
4		S <sub>2</sub> S <sub>3</sub> S <sub>3</sub>								Crib attendant checks slip authorization. If O. K. fills order.
5		T	S <sub>1</sub> S <sub>2</sub>							S <sub>1</sub> filed on board, S <sub>2</sub> filed in Tool Rack.
6	S <sub>3</sub> T									S <sub>3</sub> filed in worker's Tool Box.
7			S <sub>1</sub> S <sub>2</sub>							When need for tool is finished Time Lapse-Why Several Days.
8		S <sub>1</sub> S <sub>3</sub>								
9		S <sub>3</sub>		T				S <sub>2</sub>		Place tool back in Tool Rack.
10										Record use of tool on Tool Record card.
11								S <sub>2</sub>		
12										
13										
14										
15										



**LEGEND**

S.	TOOL SLIP	
T.	TOOL	

EXAMPLE 2

ROUTINE SEQUENCE CHART

COMPLETENESS AND ACCURACY

CHECK SHEET

	CHECK EACH POINT CAREFULLY	NO	YES	IF NO	
				STEP NO.	REMARKS
1	Is each copy of each form originated?				
2	Does each place of performance occupy one and only one column?				
3	Does each copy of each form have a definite purpose or use?				
4	Does each copy of each form end in a permanent file or destroy?				
5	Does each copy of each form have a separate line indicating its flow?				
6	Is each flow line identified?				
7	Do the number of lines entering each place of action equal the number of lines leaving each place of action?				
8	Do the number of lines entering each "check" equal the number of lines leaving each "check"?				
9	Do the number of lines entering each temporary file equal the number of lines leaving each temporary file?				
10	Does each step have only one action?				
11	Does the chart read chronologically from top to bottom?				
12	Is the chart properly identified?				
13	Are all explanations complete?				
14	Is each symbol recorded in the legend?				

### EXAMPLE 3

#### Grocery List—Ungrouped

Bread	Root beer
White, 2 loaves	Coca-Cola
Rye, 1 loaf	Biscuits
Cottage cheese, small curd	Soda crackers
Milk	Graham crackers
Lunch meat	Cakes
Ham	Ice cream
Bologna	Chicken
Hot dogs	Breasts & thighs
Soup	Steak
Vegetable	Paper towels
Chicken gumbo	Shampoo
Chicken noodle	Toothpaste
Tomato	Butter
Tide	Eggs
Light bulbs	Pickles, dill
Lettuce	Relish
Oranges	Olives
Apples	Tuna fish, 4 cans
Cucumbers	Frozen orange juice
Frozen corn	Frozen lemon juice
Peas	Hot dog buns
French fries	
Tomatoes	
Sanka	
Instant coffee	
Regular grind	

*A woman may organize a shopping list to be used by her husband so that items are arranged by classes as they are grouped in the store; all bread and pastry items are listed together, for example, and all frozen foods.*

housewife creates a list for each major shopping expedition. The list may appear as in Example 3, above, with the items arranged in the order in which she considered them.

#### **The grouped list**

With more care and some concern for her husband, the buyer in this example, the wife may group the items to facilitate finding them in the supermarket. In Example 4, page 33, Grocery List—Grouped, the items are arranged by classes such as dairy, bread and pastries, frozen foods, etc. Notice that we have some overlap in the groups, since vegetables can be fresh, frozen, or canned. This overlap is an ever present problem in the development of checklists.

To facilitate maximum use of the list by the buyer, the groups should be arranged to match the layout of the store. The actual layout of the

supermarket supplies the rationale for the arrangement of the groups in Example 5, page 34: Grocery List—Grouped by Layout.

In order to make this a good working tool, we should list most of the foods which our housewife might buy. This list should be open-ended, and after each category, some space should be left to allow the housewife (planner) to add different items, as shown in the following list:



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## EXAMPLE 4

### Grocery List—Grouped

White bread	Lettuce
Rye bread	Oranges
Buns (hot dog)	Apples
Lunch meat	Cucumbers
Ham	Tomatoes
Bologna	Instant coffee
Hot dogs	Regular grind
Light bulbs (4 40W)	Sanka
Tide	Root beer
Facial tissues	Coca-Cola
Paper towels	Chicken, roasting
Soda crackers	breasts, thighs
Graham crackers	Steak
Frozen cake	Soups
Ice cream	Vegetable
Shampoo	Chicken gumbo
Toothpaste	Chicken noodle
Tuna fish (3)	Tomato
Salmon	Frozen
Dill pickles	Orange juice
Relish	Lemon juice
Olives	Corn
Cottage cheese	Peas
creamed, small curd	French fries
Milk (4 half-gallons)	
Butter	
Eggs	

*Order picking in warehouses is a similar situation. What manufacturing plant situations require the periodic use of a checklist?*

*They are very common for periodic inspections for items such as safety, fire prevention, and housekeeping and for preventive maintenance of fork trucks, conveyors, machines, etc.*

#### Breads (fresh)

White  
Rye  
Raisin  
Potato  
Buns

#### Breads (frozen)

Buns  
Loaves

#### Dairy

Cottage cheese  
Milk  
Butter  
Margarine  
Eggs  
Cheese

Order picking in warehouses is a similar situation. What manufacturing plant situations require the periodic use of a checklist? The use of checklists is very common for periodic inspections for items such

as safety, fire prevention, and housekeeping and for preventive maintenance of fork trucks, conveyors, machines, etc. A checklist can be used to compare the problem situation against a standard. In inspecting materials handling equipment, a checklist can be used to record the degree of wear and tear from a standard or from the previous inspection tour. Many large organizations which purchase fork lift trucks and other materials handling equipment also rely on checklists to guide those who specify and purchase the equipment; see Example 6, page 35, for a typical list.

In the design of manufacturing systems, the checklist is considered a must. Example 7 on page 36, a final assembly checklist, shows some of the automobile components for which assembly space must be allowed, while Example 8, page

### EXAMPLE 5

#### Grocery List—Grouped by Layout

White bread	Frozen vegetables
Rye bread	
Buns (hot dog)	
Cottage cheese	Frozen juices
Creamed, small curd	
Milk	
Butter	Bacon
Eggs	
Fish	Cake
Pickles	Pie
	Ice cream
Household items	
Drugs	
Crackers	Soaps
Soft drinks	Paper
Luncheon meats	Pretzels
Coffee	
Canned meats & fish	Breakfast food
Canned vegetables	
Meats	Canned fruits
Vegetables	Fruit

36, illustrates some of the functions for which space must be allowed.

The aid to planning which is given by checklists is most important. The act of recording the elements or factors of future actions can save much effort. An engineer who is attempting to solve a material handling problem can certainly use many checklists, possibly at least one for each phase of the steps used in his problem solving approach:

1. *Define the problem.* The checklist for this step could consist of the Kepner-Tregoe list,<sup>3</sup> which includes questions used to identify

<sup>3</sup> Kepner, Charles H., and Benjamin B. Tregoe, *The Rational Manager*, McGraw-Hill Book Company, New York, 1965.

what the problem is and what the problem is not.

2. *Gather and treat the data.* The checklist for this step could include the types of data required such as truck arrivals, wait times, unload times, nature of the cargo unloading method, where to get the data, and how to arrange and compress the data.

3. *Develop criteria for evaluation.* The checklist for this step could include investment cost, operating cost, space, project life, time to install, and availability of emergency substitutes.

4. *Develop alternatives.* The checklist for this step could include material type (packaged, liquid, gas, bulk), material characteristics (volume, size, weight, shape, fragil-

ity), move type (fixed path, variable path, continuous, intermittent, occasional), move characteristics (distance, source and destination, quantity per move, rate of movements, nature of the route, alternate routes, flow patterns, horizontal, inclines, elevate, lower).

5. *Evaluate alternatives.* The checklist for this step could include techniques such as paired comparison, ranking, game theory, dominance, decision trees, rating, average score, musts and wants, and simulation.

6. *Implement the best alternative.* The checklist for this step could include Gantt charts, Critical Path Planning, PERT, purchase notices, check design, check fabrication, tryout, deliver, install, production tryout, etc.

7. *Follow-up.* The checklist for this step could include investment cost, down time (frequency, duration, severity), safety, and deviation from original estimates.

#### Specific checklists

Specific types of checklists have been proposed to facilitate thinking creatively about problems. Some of these are:

1. *Osborn's Checklist.*<sup>4</sup> It proposes a list of words such as magnify, substitute, rearrange, etc. Each is considered in turn on a specific problem.

2. *Attribute Listing.*<sup>5</sup> All the attributes or characteristics of a thing are listed, and we examine each in its turn. In checking a fork lift truck application, a person might list lifting speed, turning radius, reliability, etc.

3. *Area Thinking.*<sup>6</sup> The three or four major areas of consideration in a problem are used as starting points and the general approach of the solution is toward the detail. This is somewhat the opposite approach from attribute listing.

<sup>4</sup> Osborn, Alex F., *Applied Imagination*, Scribner, New York, 1953.

<sup>5</sup> Simberg, A. L., *Creativity at Work*, Industrial Education Institute, Boston, Massachusetts, 1964.

<sup>6</sup> *Ibid.*

E.4 SAFETY STANDARDS FOR POWERED INDUSTRIAL TRUCKS

PARKING BRAKES

Parking brakes on all rider type trucks shall be manually or spring applied through a direct mechanical system and shall be capable of holding a fully loaded truck on a 15% grade. Parking brakes shall be an independent system.

SERVICE BRAKES

Service brakes on all rider type trucks capable of speeds in excess of five miles per hour shall be hydraulic wheel brakes, and shall be capable of holding a fully loaded truck on a 15% grade. Spring applied hydraulic brakes are not acceptable.

Brakes shall be capable of sliding tires in either direction when the truck is carrying a capacity load. The brake system shall be capable of withstanding a 250 pound pedal pressure without component failure.

Electric powered rider type trucks should be equipped with a Deadman Brake. When the operator leaves the truck, all power shall be cut off and the direction control shall return to neutral.

Gasoline powered trucks should be equipped with a Deadman Brake.

On gasoline powered trucks equipped with automatic transmissions, when the operator leaves the truck the direction control shall return to neutral.

WALKIE TYPE TRUCKS

Electric motorized hand trucks shall be equipped with a Deadman Brake in the control handle which applies the brakes and cuts electrical power when the handle is in the near-vertical or near-horizontal position. The brakes shall be capable of holding a fully loaded truck on a 15% grade.

STABILITY

Tests representing minimum stability requirements for fork trucks having basic capacities up to and including 20000 lbs. at 24 inch load center, equipped with either cushion, pneumatic, or solid tires, shall be in accordance with American Standards Association Standard B56.1-1959 or the latest revision thereof.

SAFETY GUARDS

Motorized hand trucks shall have guards affixed to the ends of the operating handle. All operating controls shall be confined within the guards.

OVERHEAD GUARDS

Wherever truck operation exposes operator to danger from falling objects, the truck shall be equipped with an overhead guard. It shall be of ample strength to support a uniformly distributed static test load in accordance with Table 1, but it is not intended to withstand the impact of a capacity load falling from any height.

TABLE 1

Truck Capacity Rating (in pounds)	Static Test Load As A Percent of Truck Capacity Rating
Thru 5000	200% of truck rating
Over 5000, thru 10000	10000 plus 100% of increment rating over 5000
Over 10000, thru 20000	15000 plus 50% of increment rating over 10000

The guard shall be capable of withstanding the impact of a 100 lb. solid hardwood cube (or equivalent) dropped a distance of 5 feet, 10 times, without fracture or without permanent deflection.

LOAD BACK REST

Fork trucks shall be equipped with vertical load back rest or rack which shall have height, width and strength sufficient to prevent the load or any part of it, from falling toward the mast when the mast is in a position of maximum backward tilt, and shall have no opening greater than the smallest parcel carried.

HORN

Rider type trucks shall be equipped with a warning horn of the automotive type.

BACK-UP WARNING LIGHT

When requested by the purchaser, rider type trucks used in areas of pedestrian traffic should be equipped with a red flashing back-up light which will flash a minimum of 60 times per minute when truck is placed in reverse drive.

FORKS

All forks shall be SAE 8640 fully forged steel. Each fork shall be capable of carrying three times the rated load of the fork truck without exceeding the elastic limit of the steel.

## EXAMPLE 7

### Plant Layout Productive Area Checklist Automotive Assembly Plants

#### Productive Area

##### Passenger

- 1) Frame, Spring, and Axle
  - a) Control arm sub-assembly
  - b) Power steering sub-assembly
  - c) Rear axle schedule and sub-assembly
- 2) Front End
  - a) Fender sub-assembly
  - b) Hood sub-assembly
  - c) Radiator sub-assembly
  - d) Air condition sub-assembly
  - e) Painted metal bank

##### Truck

- 1) Frame, Spring, and Axle
  - a) Rear axle schedule
  - b) Front axle schedule
- 2) Front End
  - a) Fender sub-assembly
  - b) Hood sub-assembly
  - c) Radiator sub-assembly
  - d) Painted metal bank

## EXAMPLE 8

### Plant Layout Non-Productive Area Checklist Automotive Assembly Plants

#### Non-Productive Area

##### Material Handling

- 1) Standard parts area
- 2) As required area
- 3) Obsolete material storage area
- 4) Truck receiving
  - a) Aisle behind leveler
  - b) Marshalling area
  - c) Wells per day
  - d) Design length of well
- 5) Storage area
  - a) Optimum size
  - b) Maximum size
  - c) Recommended aisle width
- 6) Railroad receiving
  - a) Unloading and marshalling area
  - b) Dock aisle

##### Miscellaneous

- 1) Truck receiving area
  - a) Quality control and receiving inspection
  - b) Inspection hold area
  - c) Shipping hold area
  - d) Offices and toilet
- 2) Maintenance
  - a) General maintenance area
  - b) General stores
  - c) Maintenance stores

4. *Word Stimulation.*<sup>7</sup> Lists of appropriate words are scanned for ideas and suggestions toward a solution.

Example 9 on page 37 shows the use of a standardized checklist in a problem solving situation. The progressive die operation is studied by examining each motion of the press operator in sequence. The motion is compared with the items in the list, and, if any apply, the motion and the ineffective items are recorded in conjunction with the observed or possible cause. The analyst summarizes his conclusions and develops a set of recommendations (suggestions).

#### ***Points of departure***

For those of us who wish to use standard checklists, a word of caution is in order. Use them only as points of departure. No matter how good they are, they can rarely apply to one's situation without some modification, whether by simplification, changing of items, or changing of emphasis.

In conclusion, if the question is asked, "Does the use of checklists yield good results?", the author must answer "Yes" and add that checklists are indispensable for efficient problem solving.

<sup>7</sup> *Ibid.*

# INEFFECTIVE WORKER MOVEMENT ANALYSIS

Date 7/10/70

Analysis By RS

- Long Tugging
- Fumbling Holding
- Waiting Blind
- Extra Effort Prying
- Positioning Eye-directed
- Hazardous Complicated
- Awkward Loss of control
- Changes of Control

Name of Operation BLANK RADIATOR TANK

Part No. 23945137

Operation #10 No.....

Department Name #5 PRESS DEPARTMENT

No.....

INEFFECTIVE WORKER MOVEMENT	OBSERVED OR POSSIBLE CAUSES
1. Long reach to cargotainer, left side	Cargotainer too low and too far away
2. Awkward place to die sta. #1	Design of part and design of die
3. Waiting with right hand	No activity available during place act
4. Awkward get of foot trip	Foot switch location and die extension
5. Waiting both hands	No activity available during process
6. Tugging to remove part	Part sticking in die station #3
7. Long and Awkward	Cargotainer low and too far away for place act.
8. Waiting (left hand)	No activity available during dispose and transfer
9. Change of Control	Reorientation required for die station #2
10. Tugging part	Part sticking in die station #3

*summary of ineffective movement and causes*

1. Location of cargotainers causing ineffective movements throughout.
2. Apparent unbalance of manual activity.
3. Die stations not releasing parts freely.
4. Hazardous situation can be eliminated immediately.

*suggestions for further study or improvement possibilities*

1. A cursory examination of die details to possibly improve nesting and freedom for removal.
2. Investigate material handling for possible change of container and elimination stacking.
3. Redesign work content for improved balance.



*Computer-based audits are a reality today, but they are also a threat to the CPA who watches unconcerned while those more familiar with EDP invade his field. Here are some suggestions as to what he can do —*

## **COMPUTER-BASED AUDITS**

*by Carlton D. Stolle  
Texas A & M University*

**T**H**ERE** is a burgeoning volume of writings on the audit of systems with on line-real time capabilities. The myriad of articles and books appearing are only a reflection of the changes taking place in the financial reporting systems of the different reporting entities. For anyone who is close to the profession, the statement that a change is occurring is somewhat analogous to the case of a person who stands in the rain and listens to the weather forecaster predict precipitation—the practitioner is aware of the situation! He knows that the

“horse and buggy days” of auditing are fading fast.

The change has caused a great amount of perplexity. What was once the sacred realm of the accountant is now being tampered with by the computer scientist and the operations research analyst. This is mute evidence that no profession is isolated and that we accountants had better regroup and renew our audit objectives and techniques with some vigor. In order to satisfy the client tomorrow, we are going to have to provide services that go beyond the

mere area of opinion generation (witness the growth of management advisory services). We must have the capacity to provide the services that the client needs to be able to make informed decisions for the achievement of company goals—services that are now possible through information stored in the financial data base of the client but that have yet to be released because someone has not yet realized the importance of the specific information or does not know how to extract and analyze the data. Here is a vast new resource which

the public accountant can begin to explore with modern technical audit applications.

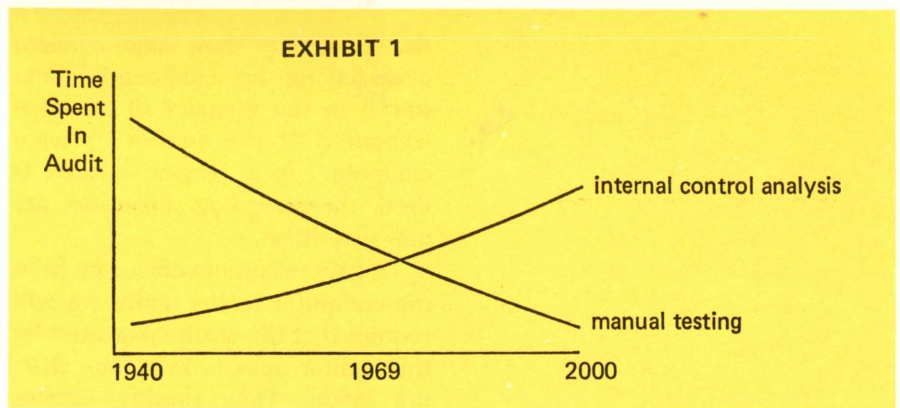
No group has a greater awareness of the structure of an organization's financial status than the accountant, and most business decisions originate within the financial structure. Whether the financial data base is eventually unlocked by the internal accounting staff, the operations research specialist, or the independent accountant is of little initial concern to the audit client as long as derived benefit can be seen. But if pertinent internal information waiting to be discovered is consistently uncovered by someone other than the public accountant, there will be a time at which the auditor's client will begin to wonder why the public accountant—usually a respected firm of CPAs—seldom brings the pertinent information into focus on a timely basis while the audit is being performed.

### **Accountants are vulnerable**

We wholeheartedly concur with Richard Mattessich<sup>1</sup> in his belief that the science of the operations analyst is gradually encroaching upon the accountant's function and will continue to do so if the accountant does not himself become more adept at extracting, analyzing, and interpreting financial information. New disciplines are developing which use financial data as the heart of model building, simulation, and design decisions. The accountant may be stepping to the background by default if he does not fully exploit his own potential analytical ability. The question the auditor must ask is how he can upgrade his services when he knows that his prime objective is only to determine whether the financial statements "present fairly the financial position of XYZ Company. . . ."<sup>2</sup>

<sup>1</sup> Mattessich, Richard, *Accounting and Analytical Methods*, Richard D. Irwin, Inc., New York, 1964.

<sup>2</sup> "Auditing Standards and Procedures," *Statements on Auditing Procedure No. 33*, American Institute of Certified Public Accountants, New York, 1963, p. 57.



The answer seems to be that as long as the auditor uses techniques that were created a score of years ago (on financial data that are much more voluminous and complex today), both the time constraint and the economic constraint will make any meaningful additional services difficult to render.

Looking solely at the audit function, we see that the voluminous data that must be examined are tending to demand that more and more attention be given to analysis of internal control. (See Exhibit 1 above.)

Not only is it desirable to evaluate the company's control procedures as a prelude to the expression of an opinion, but it has become a necessity. The auditor is finding very often that individual account examination is becoming exceedingly difficult because (1) the volume of data makes detailed auditing financially prohibitive, and (2) the accounting techniques used have made transaction tracing extremely strenuous. The use of statistical techniques in testing the accuracy of "judgment" auditing has shown that detailed audit tests often lack a sufficient number of sample elements to make the test results reliable. To offset some of the difficulties, it is rapidly becoming evident that computer technology is going to prove an invaluable audit tool.

In this article we are going to examine the feasibility of and applications for using the computer in the conduct of the audit. The purpose is to give the auditor a broad perspective on the computer's capability to rapidly test, analyze, and make decisions. This

does not necessarily imply either auditing "around" or "through" the computer in the context in which those terms are used today. It will be a necessity that the auditor have access to a computer of sufficient sophistication and that the computer be equipped with special programs that will test the output or even the operational characteristics of the client's computer operations.

### **Prerequisites**

Because we are discussing the possibility of making the computer an audit tool, we will require the auditor to have certain facilities available. Generally, two possibilities exist for acquiring these facilities:

- a. The auditor may have his own "in-house" computer at the firm's home location.
- b. The auditor may lease the computer services from a service bureau in his area.

The latter arrangement appears to be most feasible. Not many public accounting firms have facilities which are sophisticated enough for the applications we will later discuss. With a service bureau leasing arrangement (which is available in most metropolitan areas), the auditor can buy the services he needs without undergoing the cost of extensive hardware and software expenditures.

In some applications the computer of a client may be used, but this arrangement offers some severe disadvantages. First, the auditor needs to maintain control over his own operations and programs. Second, if the auditor serves more than one client with only one computer,

***The auditor now has his choice from among several lightweight, portable remote terminal devices. They go where the auditor goes. Whenever access to the service computer is needed, a regular telephone mouthpiece/receiver is placed on a special cradle on the remote terminal, the computer's telephone number is dialed (opening the communication channel), and information is inserted via a special keyboard on the terminal.***

the client may show some concern over having his confidential data stored in the memory of an alien computer. If the auditor's private computer or a service bureau is used, the foregoing difficulties are not so critical.

To gain maximum efficiency from the computer in the audit, we will require that the equipment used by the auditor operate in a time sharing mode. Time sharing implies that the central computer (that is, the auditor's computer) be (1) electronically accessible from the client's firm where the audit is taking place, and that it be (2) electronically accessible by more than one auditor at different locations at the same time. Time sharing allows one computer to service many remote inquiry terminals simultaneously. In total, Vern E. Hakola depicts the time sharing configuration as:

"Time sharing is:

"1. *On line*, with remote terminal units connected directly to the computer via a communications system (telephone lines usually). The on line connections can be made and broken much like an ordinary telephone call.

"2. *Real time*, in that it responds to user demands for computing service within time constraints which allow the computer to become an 'in line' part of the operation being performed. To qualify, for example, the computer must supply order status information while a customer is on the telephone, or bank balances while the customer is at the teller station.

"3. *Multiprogramming*, where more than one computer program is in operation within a given computer, with the programs automatically switching, based on a designated priority scheme.

"4. *Multi-access, mass storage*, in that it must provide for independent access by many users and, by implication, requires mass storage to retain programs and data for many users.

"5. *Interactive in a conversational mode*, in that it must recognize

the need to minimize the training and experience level of many users if it is to be generally acceptable. Thus it must guide users in a conversational mode whereby it asks for information in a user-understood language . . . test the user entry for validity and request re-entries when required. . . ."<sup>3</sup>

Technologically, computer-based audits are possible today. As was stated before, there must be a communication link between the firm being audited and the computer which is housed at the service bureau. The geographical distance between the remote terminal and the service bureau may be many miles, and the communication link may be ordinary voice-grade telephone lines.

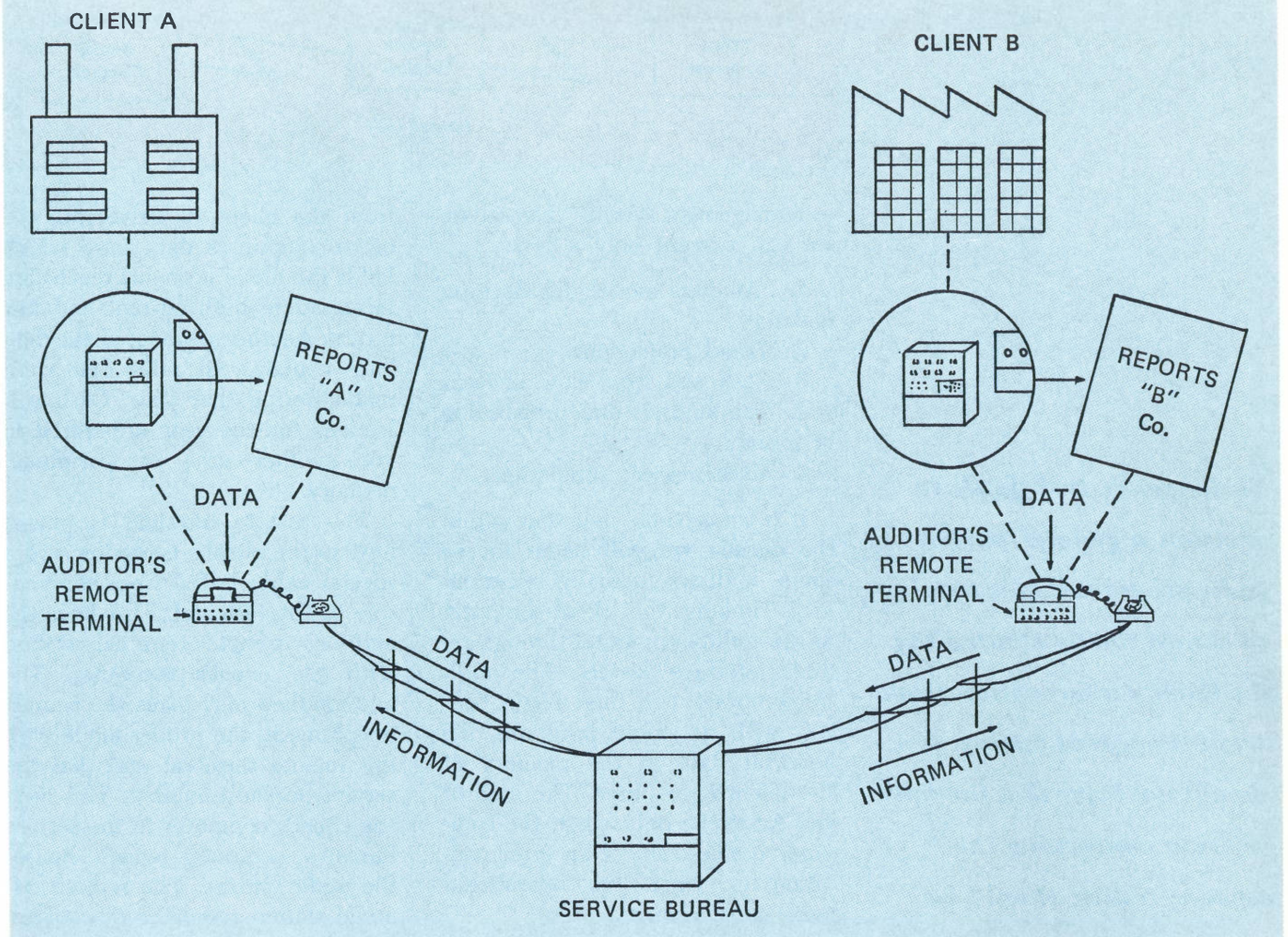
#### ***Service only when needed***

This configuration should not imply to the reader that the client who is being audited must be permanently connected with the service bureau computer. The auditor now has his choice from among several lightweight, portable remote terminal devices. They go where the auditor goes. Whenever access to the service computer is needed, a regular telephone mouthpiece/receiver is placed in a special cradle on the remote terminal, the computer's telephone number is dialed (opening the communication channel), and information is inserted via a special keyboard on the terminal. Only after this procedure has been accomplished is there any link between the client's organization and the servicing computer.

The previous explanation was oversimplified and superficial, but it does describe the method by which the computer can be used from varying remote access points. Two or more auditors can be "in the field" at one time, and they can make use of the same computer at

<sup>3</sup> Hakola, Vern E., "Computer Time Sharing and the CPA—Opportunity or Problem?" *The Journal of Accountancy*, January, 1969, p. 64.

EXHIBIT 2



the same time from their different locations. (See Exhibit 2 on this page.)

Many audit tests are very routine and redundant. They are performed on virtually all clients or on one client repeatedly each year. It is the redundant application that is most amenable to computer programming. If one computer program is capable of doing in one-half minute with high efficiency the work that may occupy two hours a day

manually with relatively low efficiency, we can begin to see the economic costs and intellectual talent that can be saved if the procedure can be applied to many clients. The same computer, housing the same generalized audit programs, can be used repeatedly from any geographical location, thus saving time and money.

Practical applications fall into two major categories: those relating only to audit test and those relating to managerial services. Indeed, in the audit realm, we may place the following applications rather easily:<sup>4</sup>

1. The use of the service com-

puter to select sample elements by statistical methods or to analyze the results of the elements tested

2. The use of the service computer to test the reasonableness of account balances

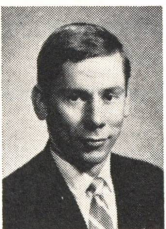
3. The use of the service computer to test the accuracy of depreciation and amortization provisions

4. The use of the service computer to test accrual adjustments

5. The use of the service computer to prepare confirmations and to analyze the results of the replies.

The above list is by no means a complete summary of all of the possible applications, but it should give the reader some idea of the power available through computer usage. Disregarding audit accuracy, the time saving alone will be a tremendous positive factor under such a system.

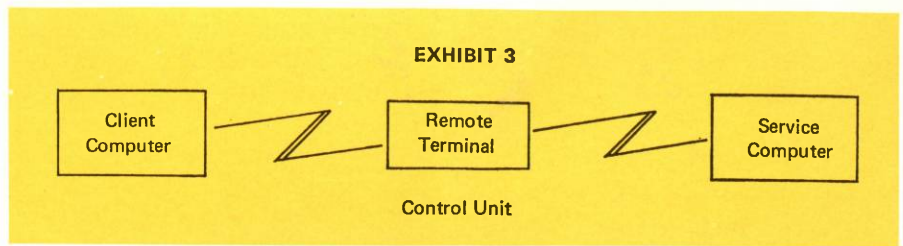
Since applications involving managerial service aids are as variable



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<sup>4</sup> The reader may wish to consult "Generalized Computer-Audit Programs" in the January, 1969, issue of *The Journal of Accountancy*, pages 54 through 62. Dr. W. Thomas Porter discusses in some detail and gives examples of applications involving "generalized" service programs.



as management systems themselves, we can present only a few:

1. Analysis models for decision making
2. Trend projections
3. Cash and fund flow analysis
4. Tax analysis and preparation of forms
5. Mathematical simulations.

*No longer is it difficult to envision a general purpose audit program that is capable of almost totally eliminating the human intervention from detailed account testing. We should not infer that the final decision concerning the account testing should be made by the computer. We are implying that the computer should be used as a tool to eliminate the manual efforts now requiring so much of the auditor's time.*

It is conceivable now that within the decade we will begin to see some auditors actually electronically linking the client-computer to the auditor-computer through remote interface devices. The auditor-computer can then begin testing, with its stored programs, the financial data in the memory of the client's computer. The auditor will intervene only when the computer notifies him of an error condition or when the operational mode must change.

#### **Human error minimized**

No longer is it difficult to envision a general purpose audit program that is capable of almost totally eliminating the human intervention from detailed account testing. We should not infer that the final decision concerning the audit opinion should be made by the computer. We are implying that the computer should be used as a tool to eliminate the manual efforts now requiring so much of the auditor's time.

Picture, if you will, a service bureau computer in which is stored a general purpose audit software routine. The audit program calls for the auditor to perform a detailed test upon the client's accounts receivable. The account balance consists of a large number of subsidiary accounts and comprises a significant balance of total assets. The auditor obtains permission

from the client to delve into the client-computer's data base which holds the file of accounts receivable information—both current and historical. Another segment of the data base contains all sales that were made during that year. Cash collections for the year are stored in yet another area of peripheral memory.

The remote terminal is placed next to the client's computer and a special cable is fed from the console to the terminal. This links the auditor's remote terminal station with the client's computer. The auditor then may place the nearest telephone in the proper mode with the remote terminal and dial the service bureau's number. This links the client's computer to the service bureau's computer which houses the audit routine. The remote terminal station serves as the control link between the two computers. (See Exhibit 3 above.)

The service bureau houses the computer which will actually do the auditing with an accounts receivable audit program capable of performing the following functions:

1. Testing the footing of the total of accounts receivable.
2. Testing for any accounts with credit balances and storing them for a later exception printing.
3. Mathematically determining the number of accounts to be sampled at the error range and confidence level the auditor specifies via the remote terminal.
4. Choosing subsidiary accounts to be tested.
5. Writing confirmations to be sent to selected individual customers.
6. Having selected the accounts to be tested, the service computer can scan the data base of the client's computer and locate all sales for

the sales file and cash receipts from the appropriate storage area in the client's computer's memory. The sales and the receipts can then be summed and matched with the ending balances in each account being tested. Any differences found will be flagged for another exception report.

7. Based upon the magnitude of the located errors in (6) above, the computer can mathematically determine whether the account balance is within the parameters established in (3) above.

8. The program can also test the reasonableness of the bad debt allowance, age the accounts, and determine the average collection period.

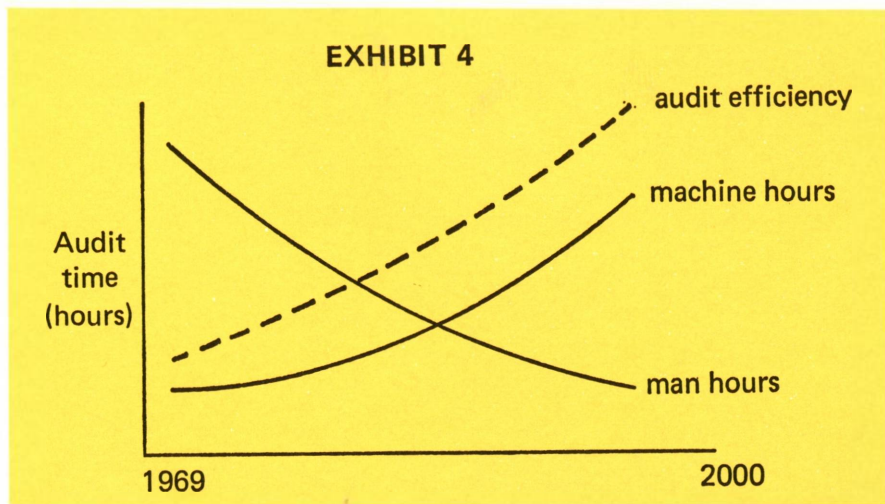
To initiate processing the auditor will encode special information into his terminal for transmission to the service bureau. The information required before processing can begin will be the following:

1. The service computer must be informed which program it will need to perform its intended function. In essence, the auditor will tell his computer, "I will need the accounts receivable audit routine. Please be ready."

2. Since the accounts receivable audit routine is a general program which can operate on the data of several clients even though the clients' files are in different formats in memory, the auditor must inform his computer where to search for the proper data and what those data will look like in memory.

3. The auditor then will "key in" information that indicates acceptable statistical tolerances. For example, the auditor may be willing to accept a  $\pm 5$  per cent error range with the assurance that he can be 90 per cent confident that the sample results will be representative of the entire receivable file.

After this last bit of information is transmitted, the service computer will begin processing—reaching directly into the client-computer's memory to search for data. Minutes later, the computer will print the



following information for the auditor to analyze:

1. Which accounts were selected and tested in detail.

2. A confirmation for certain accounts. (The computer could have been programed to heuristically prepare confirmations based upon its experience with account ages, dollar balances, account activity, or any other programable variable.)

3. A list of accounts in which there was incorrect action and the nature of the discrepancies.

4. An indication whether the results of the detailed tests were within the statistical limits supplied by the auditor.

5. Finally, if requested, the computer could print an analysis of the uncollectible accounts written off, prepare an aged account analysis for management, and determine the average collection period.

Does this all sound too Orwellian? Technically, it is now feasible to do just what was described. However, the software support for such a system requires considerable human preparation time and talent. The point to make, however, is that what may take several man-days using current audit practices will some day be done in very little man-time and the machine-time will be measurable in minutes. The budgeted time for the audit can be reduced while audit-analysis efficiency can correspondingly be increased. (See Exhibit 4 on this page.)

Time sharing audit systems are only slightly past the point of conception. Most computer-based audit work is still largely theoretical or is done on the computer of the firm being audited, and the audit that is conducted "through" the computer is but a crude approximation of what will come in the years ahead.

Looking into the future, we can visualize the gradual acceptance of the computer-based audit. But widespread acceptance will not occur until the following conditions are met:

1. There is a sizable increase in trained specialists able to implement and utilize advanced audit systems.

2. The client is no longer able or willing to absorb the spiraling costs for the annual manual audit.

3. Manual audits cease to fulfill their designed objectives because of the volume and complexity of data generated by the large business organizations.

4. A genuine need for the use of advanced technology is accepted by the auditing profession.

The substantial reduction of man-hours involving tedious but necessary testing can eventually be realized while audit efficiency is increased at the same time. Once the auditor has been relieved of many of his tedious duties, he can be more cognizant of the client's operational and control problems and can better use his time to provide a better service to the client.

*The verbatim text of a luncheon talk given at last year's AICPA conference on computers by Louis M. Kessler, AICPA immediate past president, underlines the vital importance of automation to all CPAs—*

## **ACCOUNTING PROFESSION'S OPPORTUNITIES IN EDP—TODAY AND TOMORROW**

*by Louis M. Kessler*

*Alexander Grant & Company*

**B**ACK in 1956 I participated in a feasibility study regarding the installation of computers in Signal Corps depots throughout the United States. It was just five years after the first commercially available computer was installed and only two years after the first business installation of a computer. We decided on a configuration not then in being—the old drum-storage IBM 650 with tape drives hung on. The “far-out” or “Cloud 9” item that was then mentioned was the 350 Ramac—disk storage with random access.

Shortly thereafter I wrote a book for the use of our staff and talked about “on and off” binary bits, bi-quinary numbers, seven-channel tape, record lengths, and “check bits.” I even illustrated a program routine on the 650 for processing social security deduc-

tions, to check to see if the maximum had been reached, and illustrating the “branching” routine.

Beginning in the '60s the computer age was upon us, and I quickly recognized a generation gap.

On October 3, 1969, the *San Francisco Examiner* devoted a full-page article to the computer and its usefulness to commit fraud. The article discussed various cases of computer-aided fraud and included a rather startling comment. “The gap is clearly evident. The science of auditing now is about 10 years behind the computers,” says one data processing expert. “And it will stay behind.”

The quote from the *San Francisco Examiner* indicates an awareness of how some of the public view auditors and their relationship to computers. Fraud, of course, is not the part to be emphasized; the

part about being “10 years behind” is. Are we really this far behind, or are we behind at all?

Each of these questions must be viewed by each member in relation to his type and size of practice, objectives, and available resources.

The accounting profession is challenged in many ways and data processing is only one of them. However, my remarks today will concentrate on the subject of data processing and its challenge to the profession.

Let's look at the areas of service which we offer our clients and the opportunities which data processing capabilities make available to us.

First let's discuss auditing—and the attest function still accounts for well over 50 per cent of the work of most public accounting firms.

Reviewing the internal control of

a data processing system provides us with an opportunity to give constructive comments concerning the client's operation. It may also allow us to reduce audit time if internal control is exceptionally good. However, good internal control in data processing tends to be the exception rather than the rule.

Finally, a thorough review of internal control will aid the auditor in determining the proper scope of the audit, along with spotting areas where the computer can be used as an audit tool.

The AICPA has published an excellent book, *Auditing and EDP*, by Gordon Davis, and over 20,000 copies have been sold. This book provides a good background for an auditor and offers some guidelines, for example, a sample internal control questionnaire, and examples of documentation.

The Institute is currently working on a follow-up study—a guide for the auditing of service-bureau-produced records.

Gordon Davis says, "If he is to deal effectively with the computer, the auditor should have computer knowledge and capability at two levels:

"(1) A knowledge of computers and computer-based data processing sufficient to review adequately the internal control of the system he is auditing, to conduct proper tests of the system and to evaluate the quality of the records, and (2) an ability to use the computer itself in the tests, if necessary or desirable."

This use of the computer as an audit tool is something that must be explored thoroughly in any audit of computerized operations.

If we are very knowledgeable, and can review and control the client's work, then programs written by the client may continue to be a good approach for auditing the client's computerized files. However, this review and control function is very time-consuming and will therefore often be impractical as a means of auditing the data. A better approach would be to independently review the client's

files through auditor-written programs in connection with the review of internal control.

The problem with this, again, is time, and it is often not practical to teach the auditor how to program. But he should be given the capability to deal with the computer directly without spending a lot of time acquiring specialized training.

In other words, the auditor may use programs written by the client, he may use generalized audit programs, or he may use programs he has written himself or that have been prepared under his supervision. If the auditor uses programs written by the client, he must satisfy himself that the program is performing correctly and in accordance with his wishes.

He may obtain this assurance by testing samples, tracing totals to controls, etc.

There are many audit functions which do not vary greatly from client to client. Accordingly, several firms within the profession and others outside the profession have developed generalized audit programs or routines which can help the CPA while at the same time committing him to a minimum time for training and likewise requiring a minimum time per application per client. Some of these programs have been or will be made available through the Institute.

For example, the Institute has previously offered training in the AUDITAPE system. This system allows the auditor to select data from client files on the client's premises using the client's computer. Now the Institute will offer training in AUDASSIST. This system involves elementary computer language which uses audit terminology. It is planned that processing of client files and system support will be offered by the AICPA through a central processing center.\* Training for AUDITAPE lasts two days. Training for AUDASSIST

\* Such a center was opened by the AICPA in late fall, 1970.

*. . . a thorough review of internal control will aid the auditor in determining the proper scope of the audit, along with spotting areas where the computer can be used as an audit tool . . .*



## The problem is those who are not here and I urge you to spread the word . . .

is three and a half days. Most other systems involve comparable training-time requirements. These times are well within the budgets of even the smallest firms.

If the auditor prepares a computer program to perform processing on client records, his audit objectives must be clearly defined. As in the case of a client program, he must satisfy himself that it will perform satisfactorily and in accordance with his wishes, but he has added responsibilities in that he is preparing his own program specifically for that assignment.

As the CPA uses the computer as an audit tool, he will discover new opportunities to study the interrelationships of data contained on various client files. He will thus minimize audit time while at the same time expanding the audit scope and providing better client service.

The Institute is now performing audit research which includes data processing relationships with auditing. Noel Zakin and John Mullarkey discussed other areas in which the Institute stands ready to serve its members. Also, an advisory subcommittee of the committee on computers and information systems is currently reviewing the educational requirements of CPAs as they relate to data processing. Another advisory subcommittee is conducting an audit software study in order to determine which pro-

grams are currently available or are going to be made available to the profession, as well as a review of their capabilities.

In our concern with computer auditing, we should not lose sight of the generally accepted auditing standards promulgated by the Institute and should see that they are applied in the auditing of computerized systems.

For example, the first general standard relates to adequate technical training. This means that the auditor should be trained in examining computer-based accounting systems—and fortunately this applies to most of you.

The second general standard relates to independence of mental attitude. The auditor must be capable of making his own judgments. It is not sufficient to rely on explanations of the client's own EDP staff. Furthermore, he cannot rely on a service bureau on the theory that it is independent.

The third general standard relates to due professional care. This implies an ability to use procedures specifically designed for computer-based systems.

The first field work standard says that work should be adequately planned and assistants properly supervised. This involves timing problems, and if you don't understand the procedures you can hardly give adequate supervision to an assistant.

The second field work standard pertains to evaluation of internal control. This is perhaps the clearest example of the need to develop special skills. If a client has spent vast sums of money to build controls into its systems, it will expect the auditor to understand and appreciate them and not to ignore them, even though the auditor may make some tests of his own.

The third field work standard deals with competent evidential matter. This involves new methods

of documentation—for example, flow charts, logic diagrams, and decision tables.

In specific applications, it does not take a computer genius to understand some of the obvious uses of the computer in auditing.

For example:

1. Searching an inventory file of 50,000 items for excess quantities, high-cost items, ABC stratification, slow-moving items, and obsolescence, or
2. selection of random samples—and perhaps printing out accounts receivable confirmations, or
3. the use of test data—to test not only the clients' programs, but to balance to controls, verify computations, and check file maintenance.

Other obvious uses are checking inventory pricing and extensions, checking expense ratios to highlight items for further investigation, comparing physical inventory test counts to perpetual records, checking actual costs against engineering estimates and standard costs, and matching receivable confirmations against the clients' open items.

These are just a few of the more obvious examples which take some of the drudgery out of auditing and make it, as Harold Weiss said this morning, interesting and exciting.

Many of you here are obviously quite knowledgeable in computer auditing techniques. You are either already with it or you are getting with it—and I congratulate you. And the fact that most of you are a generation younger than I is not a coincidence. But, like the problem of the preacher on Sunday morning, the problem is those who are not here—and I urge you to spread the word to your CPA colleagues—and don't hesitate to use the facilities of the Institute—to help in the educational process.

In the area of management advisory services, data processing pro-



LOUIS M. KESSLER, CPA, is chairman of the executive committee of Alexander Grant & Company and is in charge of the firm's international relations. He is the immediate past president of the AICPA. Mr. Kessler has also been

active in the Texas and Illinois Societies of CPAs. He received his B.S. and M.S. degrees from the University of Illinois and also served on the university's faculty.

**. . . to your CPA colleagues—and don't hesitate to use the facilities of the Institute . . .**

vides us with many opportunities to serve our clients.

The one aspect of data processing we can be certain will remain constant is change. Man's ability to create has been increased many fold through the computer, and new uses are developed daily.

For those who believe the computer is just a high-speed, expensive accounting machine, there is little hope. But those who see the computer as a facility to accomplish new techniques or objectives will receive gratifying long-range benefits. The computer can enable management to obtain better decision making data.

As CPAs we are in an excellent position to know the needs of our clients and to propose new and beneficial uses of the computer—regardless of whether the hardware is on or off the client's premises.

Practical-minded businessmen are turning to service bureaus in increasing numbers through time sharing and remote batch operations. The glamour and status of an on-premises computer seems to be declining in favor of the service bureau route.

Management is finally beginning to realize the computer is not a toy. We should accept the responsibility of educating our clients' managements to get maximum performance from their computers. Above all, we must get our clients' managements *involved* in the decisions which affect the computer and its control.

We must accept this responsibility and educate our clients to get top management involved.

The January, 1970, issue of *Business Automation* had this observation, ". . . management for the most part is yet to really get involved in the systems function. Surrounded by technological revolution they remain reactionaries, clinging to past methodologies, seeking to isolate themselves from the changes they

seem unwilling to understand." This attitude by management has to be changed, and we are in a unique position to provide the education which will change this attitude and allow business to move, through the use of computers, much more effectively and quickly.

Communications and scientific management are methodologies which are finally coming into vogue. The technicians are learning that in order for their ideas to be accepted by management, they must be able to explain them to the average manager, and not just to each other. CPAs are in an excellent position to act as a liaison between client and technician, but it will, of course, be necessary for the CPA to acquire the technical background in order to provide this type of professional service.

CPAs are also in a unique position to help clients plan the use of the computer, and one way is to act as a buffer between management and the technicians, who mean well, but who may not understand management's problems.

Manual systems will become very important in order to feed the voracious appetite of the computer. We can significantly help our clients in this area to more efficiently feed and control the input to the computer.

The so called "unbundling" (that is, separate pricing of hardware and software) has also created opportunities for the profession. Large numbers of software packages are and will become available for purchase. We should be in a position to provide our clients with an independent evaluation of these packages in relation to their needs. In order to do so, we must, of course, have the requisite technical knowledge.

The third area which offers an opportunity to serve our clients is that of general accounting services.

New developments in data proc-

essing allow small clients to economically take advantage of the computer to process their data on a relatively sophisticated basis. Our clients' competition will in fact dictate the necessity for them to have available information which may not be currently available, for example, project control, forecasting, simulation, etc. Clients of all sizes will be taking advantage of services provided by time sharing facilities and service bureaus whether or not they are operated by CPAs.

By providing data processing services to his clients, the CPA can strengthen his client relationship, provide better service, and increase the chances of retaining clientele as they grow and as technology evolves. The CPA can use these services as a natural step toward providing the management advisory services previously discussed. Services of this nature help strengthen the public image of the CPA, and they provide him with a basis to develop himself further as computer technology evolves.

The CPA has many opportunities to turn the computer to his own use. We should not have the same fault as the shoemaker and his children. We should use the expertise and advice we give our clients to improve the management of our practices. If we are capable of designing management information systems for clients, we should also put these skills to use for ourselves; after all, we have a business organization to operate also. There are many areas to be considered for data processing—each of course must be weighed the same way we tell our clients to weigh them.

That is, each of the firm's systems to be computerized must meet the objectives of the practice and be valid for economic and managerial reasons. Some of the areas of opportunities are:

- 1) Billing Information and Analysis

- 2) Financial Statements
- 3) Personnel Records
- 4) Statistical Data Regarding Clients, etc.

I believe the profession is beginning to gear up to meet its client opportunities and responsibilities.

Those who are still behind will have to catch up; those who are current will have to work even harder to meet the challenge of data processing in the Seventies.

Dick Helstein, as president of the New York State Society of CPAs, prepared a paper for delivery at the 73rd annual meeting of the Society a week ago tonight. Unfortunately, Dick was not able to give it because of illness, but it was made available to us at the meeting.

In discussing "The Challenge of the Computer," Dick said, "EDP introduced radically new ways of preserving operational information, and while EDP users have been slow to adopt advanced applications, radically new ways of auditing will ultimately be needed. They will be needed because as industry continues its transition from the old information systems to the new, traditional audit trails will disappear. We'll need new audit procedures to analyze that information and new audit procedures to test its reliability.

"To implement these procedures, we'll need new techniques—computer techniques. The computer itself will become increasingly an audit tool, through the accountant's own audit programs.

"With computer programs doing part of the work the auditor did in the past, the education, activities, and responsibilities of the auditor will change. The audit team will change. Responsibility will be divided between specialists and generalists, with overlapping but separate knowledge and skills. The specialists will know something about auditing—and a lot about computers. The generalists will know something about computers—and a lot about auditing. Neither will be complete without the other, and from their interdependence,

we'll have a new auditor to go with the new auditing."

The pace of innovation will quicken, and we and management must learn to cope with change. The computer will aid in directing and controlling new challenges, but only if it is used wisely.

Certain graduate schools are implementing curricula which teach their students not to be administrators, but to be managers, that is, they will become *managers of change*. (As mentioned in the April 25, 1970, issue of *Business Week*.)

We will have to be prepared to meet the demands these new "managers" will impose on our profession.

Education will be a key in the next decade. All college graduates will most likely have encountered the computer in some form and will be ready to put it to new and more sophisticated uses. People in nearly all occupations will need to know how to use computers effectively in order for their companies to compete. There will be computer scientists who will do the programming and the developing of new hardware. And there will be many others who will make extensive use of the computer as part of their day-to-day routine.

CPAs should be leaders in this area. According to *Business Automation* magazine, the future will see more than one-half of all computers communications-oriented. They will be used for remote computing as well as message switching.

Minicomputers will also become a significant part of the computer community and will be used to solve many specialized problems for businesses of all sizes.

We must meet these challenges of enabling our clients to cope with the technology of the future or concede a good portion of our practice to others.

As you can see, the challenges are many and varied. All of them will affect our personal and our professional lives. We must not only keep up as CPAs; we must be leaders and not followers.

***The audit team will change. Responsibility will be divided between specialists and generalists, with overlapping but separate knowledge and skills. The specialists will know something about auditing—and a lot about computers. The generalists will know something about computing—and a lot about auditing.***

*Dangers of CPAs without EDP knowledge auditing client with computer records stressed; tax experiences recounted; ways of dealing with service centers outlined at San Francisco meeting —*

## **SIXTH ANNUAL AICPA COMPUTER CONFERENCE**

*A Management Adviser Staff Report*

**B**USINESS computers, which started out as high-powered book-keeping machines, are inevitably tending to become more or less like the process control computers that today are running entire manufacturing processes, Harold Weiss, director of The Automation Training Center, told the audience at the AICPA Sixth Annual Conference on Computers and Information Systems in San Francisco last year.

In his keynote address, Weiss said that the rising costs of clerical and accounting workers and the declining costs of individual computer calculations are propelling industry toward "computerized business systems that are considerably self-controlling, self-auditing, self-oper-

ating, self-diagnosing, and self-repairing, though not one hundred per cent."

In addition to its early task of relieving management of substantial administrative burdens, the computer today is increasingly making simple operating decisions, he said, citing the reordering of inventory items as an extremely common example.

"A more exotic recent illustration was an automated system of making markets in over-the-counter securities introduced by the brokerage firm of Paine, Webber, Jackson & Curtis," he continued. "The industry had always argued that the function of a trader demanded human judgments."

The prevalence of computers in companies, the improvements in smaller computers, and the widespread use of time sharing and computer utilities will make it next to impossible for the average accounting practitioner to "avoid getting heavily involved with computer-based accounting systems" in the future, Weiss said.

Computer hardware is undergoing significant changes, he said, with performance per dollar doubling every few years, but software is falling behind rapidly.

"We'll be dumping fourth generation hardware in the midst of second generation programmers and systems people, and manual auditors and top management!" he

warned. "We never fully utilized first or second generation computers, and I predict that many systems designs or even programs of that era will be grinding away on fourth generation computers."

The drop in the cost of on line mass storage of machine-produced data, its miniaturization, and the economic burden of creating hard copies are putting greater pressure on moves to restrict conventional audit trails, he said. Yet the data contain "potential gold mines of information lying unrecognized in already machine-stored data bases in most organizations." The challenge to systems people, auditors, and management is to get it extracted.

Software support, in spite of the fact that its development has lagged behind hardware development, is increasing by a factor of about ten in every computer generation, he continued. Over 3,000 software packages are now offered by private companies and more are arriving every day.

Too, data are entering many systems closer to the point where the transaction is initiated, more and more commonly via direct entry devices, he pointed out. Thus, the computer encompasses more of the system. All of this contributes to the brevity of some aspects of the visible audit trail and increases the significance of purifying input data since errors are increasingly difficult to detect, trace, and correct once they have entered the system.

All of this contributes to the increasingly hazardous nature of computing in the 1970s, he said.

"Increasingly ambitious systems developments are being undertaken—systems of great scope, complexity, and hazard," he continued. "There is substantial integration of financial and nonfinancial information in many of these systems. More and more we are dealing with real time systems, where the results of computation must keep up, in very brief time periods, with events that are taking place in the business. Without reliable computer and communication service, will some

of these organizations be able to continue functioning at all? Can we really run twenty programs 'simultaneously,' and should we even attempt to do so if one or more vital applications are involved? More realistically, can we really adequately control more than one major business application at a time? We are using more complex and sophisticated techniques in our computer-based accounting systems, including real time updating of direct access stored files, often from remote locations. We 'ain't seen nothing yet' in the way of conversion fiascoes until we see a large real time application blow up on us."

### *The "big payoffs"*

Another characteristic of the '70s, Weiss predicted, would be a move toward using the computer to "go after the big payoffs."

"We don't want what in too many cases effectively are million-dollar quill pens," he said. "My own philosophy has always been to use computers to make money rather than to save money . . . clerical savings are not the big-ticket items. We need to go to the fundamental problems of managing the business, its logistics and strategic planning aspects, like production management, marketing analyses, inventory management, and the like."

Turning to the audit implications of the changes he foresees, Weiss said that the emphasis throughout the Seventies must be on "preventive auditing." This will involve a heavier responsibility for the internal auditor, he said.

"Effective controls have to be designed into our systems, particularly the more complex and innovative ones, *before* the organization relies upon them," he said. "On complex new systems I predict that we shall find much more frequently that the internal audit function will have to formally approve systems designs in advance to help ensure that they are at least adequately controlled and can be audited."

In an on line-real time environ-

ment, the auditor also has to be on line-real time, Weiss said, quoting Harry L. Brown. "He must have inquiry and testing capabilities. He must be given a key to the data cupboard! He is going to be mobile; he is going to do more concurrent auditing; he is going to be trained to perform adequate evaluation of computer systems; and he is going to be a working member of the information team, both in planning and execution."

But he has serious questions about whether most auditors in an EDP environment today are complying with the Institute's general auditing standards and its field work standards, Weiss continued.

Extreme conservatism of auditors is apt to be a particularly pressing problem, he declared. It could lead to billions of dollars in cost to the U.S. economy over the next decade, he said.

"These pressures are leading to the much greater use of the computer for auditing purposes in the 1970s," he went on.

"I distinguish three types of computer use as an audit tool," he declared. "First, audit routines can be placed in production programs. . . . A second type of audit use of the computer is the simulated problem approach with two variations—off line and on line. . . . A third type is free-standing audit programs, whether specialized or generalized."

Much software is useful to auditors, the keynote speaker noted, even though comparatively few of them have yet used it. He mentioned commercially available packages, including flow charting and documentation routines, generators, file management systems, among those too often overlooked for their audit usefulness.

"The generalized computer audit systems are probably of most interest to you," he told the audience. "These permit the auditor to retrieve a wide variety of information from the files of the organization being audited and to perform other commonly utilized auditing procedures. Thus, audit software is proliferating rapidly and we are

already into the second generation of generalized computer audit programs. These have been developed by the larger public accounting firms and some of the private software companies. A word of caution is probably appropriate. There is danger that this software will be viewed as a panacea or as a total substitute for the auditor's required computer knowledge. Audit software is only one tool in the EDP auditor's arsenal."

Mr. Weiss said that he felt the future would bring more computer training for auditors, EDP audit specialists, less rapid turnover of both internal and external EDP auditors, a more concurrent and interim type of audit, and greater reliance of external auditors on internal ones.

He foresees roadblocks to progress as:

1. Lack of adequate computer knowledge in the audit function. "This is decidedly not amateur hour when you have highly computerized clients," he told the group.

2. The lack of resources applied to EDP auditing.

3. A "certain timidity, complacency, conservatism, or even laziness" which hampers auditing organizations in dealing with EDP.

4. Excessive secrecy in the audit profession which hampers the dissemination of successful techniques and experience. "This type of meeting should have ten times its attendance. The computer professionals communicate with each other strenuously, and auditors have to develop mechanisms for coping with this frantic technological pace."

5. A lack of sufficient audit research regarding EDP to develop tools, control standards, new techniques for auditing EDP, or even evaluations of existing systems.

6. Misconceptions of audit independence by internal auditors, which lead them to remain aloof from the struggle to develop well controlled computer applications.

"Excessive audit inertia and conservatism will be economically costly to our economy and will inevitably lead to loss of your present

scope to other groups who will fill existing vacuums," he warned the audience of CPAs.

Following Mr. Weiss' keynote talk. Noel Zakin and John Mullarkey, manager and assistant manager, respectively, of Computer Technical Services at the AICPA, described briefly some of the Institute's activities in the field. The remainder of the morning program on the opening day of the meeting was devoted to a speech by Lawrence A. Welke, president, International Computer Programs, Inc., on "Selection, Purchase, and Use of Proprietary Software Packages."

Software acquisition is much too casual in most companies, Welke said, with many concerns uncertain as to who had bought their software and on whose advice.

"We should think of software as a living product that's going to endure," he told the audience.

Why is it important that accountants know about it?

For one thing, it represents possible competition. "There are twenty-five products on the market today that can eliminate CPA write-up work altogether," Welke told the group. Accountants should know what they are and the relative merits of each, he continued.

There are more than 3,000 software packages on the market altogether, he pointed out. Each of them has some tax implications under the 1969 tax law for the company employing it.

"Accountants should know enough about the field to be expert advisers on program selection, called in with an attorney before program selection is made," he said.

"We, the computer users, are spinning our wheels today producing computer programs," he told the group. "More than a million a year are written. Obviously, they're not all equally valuable. But who's to judge the relative merits of each? The CPA is the only source of balanced judgment to many clients," he said.

He advised that customers avoid software vendors who insist on selling a particular system with a par-

*... data are entering many systems closer to the point where the transaction is initiated, more and more commonly via direct entry devices . . . thus, the computer encompasses more of the system. All of this . . . increases the significance of purifying input data since errors are increasingly difficult to detect, trace, and correct once they have entered the system.*

ticular machine. There's no reason the customer should have to do this. The seller should support and maintain his product. Software for a particular application is very much the same. The client may very well want to make changes in software; he should have every right to, but he must realize that to do so himself will probably invalidate the warranty on that product.

Software pricing is still done primarily by the "finch" method, he said. The salesman quotes a price. If the customer winces, the salesman goes on to tell him all that's included in the package. If the buyer is amenable, the salesman tells him all that's excluded.

The majority of software firms won't sell their product, he said; they prefer to lease it. This involves the CPA once again because it affects the client's tax liabilities. Different states handle software leases differently: New York taxes them as tangible properties, for instance; Indiana does not.

As a living product, software can very quickly die, Welke told the audience. A technical innovation or a better program can kill a package almost immediately.

### ***Essential steps***

He listed three essential steps in preparing either to lease or buy a software program.

"1. Find out what your own specific needs are. Determine what machine you have now and what machines you plan to acquire in the present and in the next three to five years. Don't let your EDP man do any more than gather the facts; he'll be far too biased to evaluate it.

"2. Pick your vendor. If it were a well structured market, that would be simple. Since it isn't, since you can't get a Dun and Bradstreet rating, rely on your CPA as your guide and guard. Even the vendor's experience is no safeguard since the majority of vendors are brand new.

"3. If the vendor doesn't make you completely happy, if you don't trust him completely, don't have

anything to do with him. There are enough people in the field so that you can find someone who comes much closer to your ideal."

When these criteria have been met and a vendor has been tentatively chosen, the buyer should insist on a written contract. Also, it would be good to get testimony from two users of the system who are very happy with it and from two users who are completely dissatisfied; and get a demonstration of the package in action, he advised.

At the conclusion of the opening morning session, Louis Kessler, president of the AICPA at that time, spoke at the luncheon session on "The Institute and the Accounting Profession's Opportunities in EDP—Now and Tomorrow." (See page 44.)

For the Monday afternoon session, the computer group split into two sections, one for those already involved in EDP, the other for those just contemplating such involvement.

Each of the two sessions was further divided into two panel groups, each of which discussed a given topic. The first of the parallel sessions for CPAs considering involvement in EDP was devoted to "The Local Practitioner's Approach to Harnessing EDP" and was moderated by Robert B. Nadel, CPA, Hertz, Herson & Company.

The first speaker, Fern M. Waddell of John Waddell & Co., described an experience her concern had had with a client in the garbage collection business—a prime example of a major billing problem for a number of small accounts. Her firm already had a 402 but soon found that it couldn't do the job of preparing the statement, so the firm experimented with a service bureau, and found that the service bureau did a very poor job. So John Waddell faced the prospect: The garbage collection client had a problem with its statements. The accountant couldn't help it from its own resources, and the service bureau had proved unreliable. The only solution the firm could

see was to take the plunge and order heavier equipment.

John Waddell & Co. ordered a 602 and learned to operate it through trial and error.

But they kept the client.

Roy K. Lindorf said that his firm had felt it needed computer capacity, but that IBM, when approached, told it its work load didn't justify buying its own equipment. IBM suggested cooperating with another firm in the same neighborhood that already had a 1401 machine that was available on a shared basis. The 1401 owner was enthusiastic, even offering to train the Lindorf people if Lindorf would only agree to a rental agreement afterwards. But the Lindorf experience indicated that the 1401 not only wasn't right for its firm but wasn't right for the original owner either. The other firm finally turned in its 1401 for a Honeywell 200, which worked out beautifully for it, but still didn't prove adequate to the Lindorf needs. The Lindorf group finally bought a 2000, which it found slow but adequate for its needs.

R. Michael Beatty, of Kennedy & Coe, said that his firm had gone through much the same evolution as Lindorf, an evolution made even more difficult for him because he had worked for Boeing Aircraft and so was used to a large computer installation. Kennedy & Coe finally bought a 1401, Mr. Beatty said, but its troubles were not over. Friction developed between the EDP staff and the accounting staff.

### ***CPA assigned responsibility***

Robert B. Nadel, the moderator, said that his indoctrination came through a client who was being dogged by a computer salesman and who insisted that his accountant take over the responsibility for selecting data processing equipment. Nadel eventually left his accounting firm and took a job with a computer manufacturer before returning to accounting.

But his experience showed, Nadel said, that without constant

study of the computer field, even in-company experience with an EDP manufacturer was quickly outdated.

In other words, of all the speakers on the program, each had more or less stumbled or been pushed into EDP experience by outside forces or interests.

But each, once acquainted with EDP, stayed with it, in one aspect or another. Beatty said that his firm's approach was to develop programs for its equipment that could then be marketed to clients. Miss Waddell on the other hand said her firm had no package at all except a general ledger package. All other programs are specially developed for individual clients at the client's request.

Mr. Lindorf said that his firm does payroll-labor-cost labor-output breakdown. It tries to avoid straight payroll work.

Nadel said that his firm's main thrust will be use of the computer in audit work, that no write-up work is done at all. "We don't want to do anything ourselves that can be done outside more cheaply," he said. "We use specialized service bureaus for such work; we find them much more reliable and economical than general service bureaus. We use time sharing equipment for internal firm processing and plan to use it for financial projections."

Each of the speakers on the panel had particular cautions about some phase of the EDP involvement. Lindorf warned the audience to make very sure any program they were about to embark on would be economically valid for their firms. "Don't give your supplier a dime until he's performed what he said he'll do," he warned. "Get every part of the agreement in writing and have your lawyer review the agreement carefully."

Miss Waddell stressed the importance of checking the equipment contract scrupulously too, particularly the support and maintenance agreements. She also reminded the audience to make very sure the top management of the

firm really wanted EDP involvement or it couldn't possibly work.

Mr. Beatty suggested that documentation be controlled through a rigid system, in which each form had to be completed before a subsequent step could be taken.

The concurrent session for those already involved in computer operations, moderated by Richard Cutting, Main, Lafrentz & Co., drew a much larger audience than the first. The first afternoon session in the larger group was devoted to using time sharing effectively, and the first speaker, William Rowe, of Haskins & Sells, said that most time sharing applications showed the main uses in order of frequency of use were:  
Mathematical  
Statistical  
Programing.

In the accounting area time sharing has been used effectively in cash receipts and disbursements, Rowe said. He added that his firm had also developed various other computer programs. However, he stated that in the main it was best to insist that the supplier furnish general purpose programs.

On time sharing in general, he pointed out that most experience had been that if an application could be found that would justify the cost of a terminal, other jobs and benefits would flow almost automatically from the installation.

Time sharing also has benefits in terms of educating the accounting staff, in preparing and testing general purpose programs for clients, and not least in terms of recruitment.

"It looks progressive to potential employees," he said.

He described one successful Medicare application where Haskins & Sells personnel had worked with time sharing analysts to develop a special package.

H. Peter Zack, of Peat, Marwick, Mitchell & Co., warned the audience against taking a manufacturer's packaged program as Gospel.

"Modify their programs for your purposes," he said. "Do this by talking to manufacturers' represent-

*. . . on time sharing . . . he pointed out that most experience had been that if an application could be found that would justify the cost of a terminal, other jobs and benefits would flow almost automatically from the installation.*



atives and trying to get the principle behind their programs without necessarily adopting the programs themselves.”

Brock Kier, of Lybrand, Ross Bros. & Montgomery, describing his firm's time sharing arrangements, said that 38 Lybrand Ross offices at that time had terminals all connected to a central program library at headquarters in New York. All but two of the regional offices could reach the library at local phone rates, he said.

A similar arrangement could be made for smaller firms tied into a central library, he suggested, and a logical place for such a program library would be AICPA headquarters in New York.

Rowe pointed out that each firm must develop its own interface between the man on the audit job in the client's office and the computer library at a central point.

### ***Documentation emphasized***

The second Monday afternoon session for the larger group was devoted to “Documentation Standards.” The keynote was struck by the late Alan Mandelker, of Ernst & Ernst, the session moderator, who stressed the absolute importance of thorough documentation.

“Computer installations often get into trouble,” he pointed out. “That's when good documentation is vital. Poor documentation makes recovery difficult; quality documentation is essential.”

Documentation, he pointed out, is the only communication medium linking all parties to an EDP installation.

He listed the following as the minimum steps toward adequate documentation:

During the systems survey, standard forms should be used throughout, and they should show where input documents come from, what is done to them, and where the finished papers go. He showed sample survey forms on the screen while talking.

Activity models should be constructed for each activity area.

They should show what input is needed for the computer, what files are called on, and what controls should be imposed. Again Mr. Mandelker used slides to illustrate the activity model.

There should be a complete input description.

When a field name is used, there should be a complete description of the field.

System flow charting should be complete. This does not mean only the flow within the computer, Mandelker elaborated, but should show also where the information flow stems from before it gets to the computer and where control points occur. If the logic is complex, the flow chart should be supplemented with decision tables that show exactly how decisions were reached, he said.

Printed computer forms should be used to represent each output form. Again decision tables should be used to supplement complex logical routes.

In response to a question from the floor, Mr. Mandelker said he thought the N.C.R. ADS system was an excellent aid to systems planning and documentation, although it might be a little more complicated than is absolutely necessary.

John Harrison, of Main Lafrentz & Co., said there are three main reasons for thorough program documentation, for the programmer's use, for the client's use, and to support the attest function. Again using slides, he defined three conditions provided by the installation: the machine configuration, the programming systems to be used, and the materials; four by the analyst, the program specification, the run description, the card layout, and the tape and disk layout. Everything else for any program has to be provided by the programmer, he said.

He suggested that every programmer take as a minimum requirement for his job:

The certainty that he understands the program specifications for each given program,

The creation of a master flow chart for the program,

The approval of the flow chart by the analyst,

The drawing of a detailed flow chart of the program.

Standard forms and templates should be used in preparing the flow charts, he said, and standard editing checklists.

Lists of materials needed for test sessions should also be carefully prepared. These are particularly valuable for tests that are to be run away from the home base.

All testing materials should be kept as proof that a particular program was developed by a particular programmer.

If there are any program amendments they should be as carefully documented as the original material for the program.

The evening of the first day of the conference was given to informal orientation sessions for those CPAs just considering EDP activities and those already heavily engaged in them.

Tuesday morning opened with a discussion of “Computer Preparation of Income Tax Returns,” moderated by Terry Kimes, of Mize, Houser, Mehlinger & Kimes, Topeka. Mr. Kimes pointed out that one of the great advantages in using a computer in tax preparation work lay in recruiting, one of accounting's main challenges. “With a computer, the new recruit isn't faced with the prospect of doing months of eighth grade arithmetic,” he said.

Carmen Spinelli, of J. K. Lasser & Co., said that with the new complexities of the 1969 tax reform act, preparation of tax returns had become a great deal more difficult.

Early computer tax returns had required the accountant to send information to a processing center where the return was prepared and sent back. There was inevitably a great lag in turn-around time. J. K. Lasser was now experimenting with a time sharing system run from its own offices and a central computer in Boston.

Lasser uses a system of key words

on preprinted forms to complete returns. The operator enters the proper key word and the individual's tax information. The system features easily understood commands. For instance, if a key word has been used inadvertently, the word "cancel" and the key word repeated wipe out all material designated by that key word.

The system can also demand spelling out of anything that looks wrong. "Contributions" would be an obvious example. Once all questionable figures have been checked, it prints all information on blank paper, places a transparent overlay on the printed data, and mechanically reproduces the whole set as the tax return.

All the firm's tax files are also stored free of charge at the Boston computer center.

Joseph M. Moore, of Cherry, Bekaert & Holland, the next speaker, said his firm had become involved in computer preparation of tax returns as an aid to recruitment and also because it thought the machines could do a better job with returns than humans.

Feeling as they did that the entire return must be prepared by computer, Cherry, Bekaert & Holland entered into an arrangement with Elmer Fox & Co., of Wichita, Kansas, to use their Dynafax System. Dynafax is a computer system organized by CPAs in various parts of the country and run on the facilities of the local firms that are part of the organization.

Moore's firm, which has 13 offices, required each of them to prepare returns using the Dynafax system. It prepared 6,000 returns in its first year of operation and planned to do 10,000 in its second.

The Moore office key punched tax information from raw data furnished them by their clients. They felt a particular advantage for computers lay in the complications of the 1969 tax reform act. The Dynafax system, they said, covered all provisions of the new law which a human accountant would be all too apt to overlook.

Moore said his firm would never

go back to manual preparation of the income tax return, and reported that his firm didn't experience any savings the first time it used Dynafax but expected to the second time around.

### ***Why computer tax returns?***

The last speaker on the panel, Jack Martin, of Seymour Schneidman & Associates, said that his firm had developed an in-house computer system based on a 1040.

"Why computer tax returns?" he asked, "We've found it's too expensive to do it any other way. Why in-house? Three major advantages."

He listed them as cost, turn-around time, and the ability to pull changes immediately and schedule them for later return.

"If you already have a computer," he pointed out, "you can save about twenty per cent over the cost of using an outside center." Most in-house computers aren't used all of the time, he pointed out, so labor is the only cost factor in putting tax returns on them. The cost of key punching and collating tax forms is exactly the same as it is for an outside service.

In terms of turn-around time, an outside service bureau can take as long as two weeks to process a return, he said.

"In-house turn-around time is whatever you want to make it," he declared. By the proper scheduling of shifts almost anything is possible. By the same token, changes can be pulled almost immediately and scheduled for late returns if necessary. In-house turn-around time makes it possible to make the tax cutoff date much later than would be possible with an outside service.

In reply to questions from the audience, the speakers who had explained that they had not saved anything on their first experience with computer tax returns said that the greater volume of returns foreseen for the future would realize the returns they anticipated.

Another question as to the inroads of various large city banks of-

*. . . one of the great advantages in using a computer in tax preparation work lies in recruiting, one of accounting's main challenges. With a computer, the new recruit isn't faced with the prospect of doing months of eighth grade arithmetic . . .*

fering computerized tax services (expanded this year to mail order houses and loan companies) brought this reply:

"The banks sold their kit and service to middle-income groups. They ran into trouble and their service was too expensive."

Moore made the point again that computer service represented no out-of-pocket expense to the firm that already had a data processing machine.

The second morning session on Tuesday dealt with "Auditing of Service Bureau Produced Records," a panel discussion moderated by Thomas Porter, professor of accounting at The University of Washington.

Professor Porter said that he was going to give the audience a preview of the report of the AICPA advisory committee on auditing EDP systems, which was in draft stage and scheduled to be published in 1971. In 1968, he said, the AICPA had published *Auditing and EDP*, which had first pointed out that the CPA may be involved with EDP service centers in a number of ways:

1. He may be involved in helping to select the service center which his client will use.
2. He may run one himself.
3. He may work on the systems to be used in the center.

In all these situations, he is concerned with the work and the accuracy of the work done by the center.

The first chapter in the new audit guide, Professor Porter said, discusses service centers and their organization. Chapter 2 discusses their distinguishing audit characteristics, as opposed to the client's own facilities, and the fact that a client's records may be kept there. The remaining chapters of the book would discuss the auditing approach and techniques used to evaluate service-center-produced records.

Launching into a general discussion of service centers, Professor Porter pointed out their fantastic growth rate and said that five dis-

tinctive type of service centers had emerged:

1. The center that is only involved in selling unused computer time, nothing else,
2. The center that sells standard computer packages,
3. The center that designs and processes custom-tailored packages for its customers,
4. The center serving as the hub for a time sharing service,
5. The computer facilities management concept.

### **Service center problems**

Service centers pose a particular problem because they are separated physically and legally from the client and the client's files, and records may be maintained there. But the client's auditor must have access to these files and records, he continued.

Robert Benjamin, Touche Ross & Co., said that the CPA in judging a service center must depend on his own experience and judgment, the published guides of the AICPA, his own firm's publications, and any material published by appropriate regulatory agencies.

Stanley Halper, S. D. Leidesdorf & Co., saying that service bureau applications range from the simplest to the most sophisticated, said that the auditor may not be able to check the statistical reports prepared by a service center yet the figures in those reports may be vital to his client.

Benjamin said that was one reason to check the reputation of the service bureau so carefully. The Institute's guide to auditing of an in-house computer could be considered as fully applicable to a service center, he said. For instance, the control points in a service bureau should be checked just as carefully as they would be for a client's own computer installation. Also, the auditor should be very sure that all contracts with the service bureau specify that he have access to all client records.

If an auditor doesn't have enough knowledge of computer installa-

tions to run a thorough check on the control points, he should seek the help of someone who is expert from his own management services staff, he continued.

What is the system supposed to accomplish? That should always be spelled out explicitly, Halper said. An independent third party should always be brought in to review arrangements between the service center and the client. But two responsibilities are paramount between the two parties: The service center should always be able to document each step in its processing; the client should always have documentation supporting all its input data in its own possession.

After you do have a knowledge of how the service bureau claims it is processing data, Professor Porter asked, how do you ensure that the center is really operating that way?

Audit routines should be built into the service center routines wherever possible, Halper said.

What if controls are found to be vague or nonexistent?, Porter asked. What should be done then?

Extend the audit scope, Benjamin replied. Run through all client records. Suggest control improvements to both the client and the center. If they prove uncooperative, deny an opinion.

Mr. Halper then brought up the question of what happens when a service center goes bankrupt, when all figures are locked in the "black box" without originating papers. "Is the CPA helpless?" he asked.

Benjamin advised that the auditor should audit "around the computer" or through it, depending on precisely what he needed. "If you have special requirements that only the computer can satisfy, use it by all means," he advised.

The discussion then delved into a more far-ranging question: the amount of advance planning that should precede any contract with a service center. Professor Porter pointed out that each service center will serve a number of clients and will give each of them basically the same program. Each of these clients in turn will have his own

auditor. But no service center will let each of these individual auditors in to review its procedures.

"This brings up the whole question of third-party review," said Porter.

Benjamin agreed that third-party review would be necessary even though it would be unpopular with CPAs.

"One auditor will have to be selected," he said. "But here is something an AICPA committee should consider: Should that auditor be selected by the service center, or by its clients acting as a unit?"

Halper didn't answer the question posed but simply said that the amount of knowledge required and effort involved would make it mandatory that the job of checking the service center itself be handled by one man.

Benjamin recounted an experience he had had with his firm. "We were once acting as a 'third party' since we were auditors of the first two firms that demanded it. But as time went on, other firms with other auditors demanded audit time at the service center, too. Finally, the service center complained, and asked that we serve as auditors for the whole group. We said we couldn't do that, but that we would make an agreement with the other CPA firms to serve as their representatives in checking the service center. Most agreed, although a few balked at this arrangement."

Jerome Farmer, from the audience, asked whether in a third-party situation of this type, the secondary accountant, the one brought in for the group, assumes legal liability.

Halper replied that the accountant acting as a "third party" vouches only for the accuracy of the system being used by the service center; he is not responsible for the accuracy of the data furnished by the other accountants' clients.

"He is responsible for the controls and the effectiveness of the controls," Halper said. "Review of the system and evaluation of data feeding into the system are two entirely separate entities. The third

party is responsible only for the first. The client's own accountant must still take full responsibility for the client's input data."

In response to a question from the floor as to what protection an accountant had if he had built testing techniques into service bureau techniques but service bureau personnel were manipulating the techniques for their own ends, Mr. Halper replied:

"At present, systems are so simple that the client is much more apt to try fraud than his service bureau."

The luncheon speaker Tuesday was Leonard Palmer, president of Computerminal, Inc., who spoke on the "Computer Service/Client Interface." Palmer, who suggested that CPAs like service centers make their living from rendering services, not surprisingly suggested that CPAs running service bureau jeopardize their independence.

"Computer installations should be called data reduction departments rather than data processing departments," he said. "Every department in a company processes data.

"Why?"

"By law, certain data must be processed for taxes on social security, for instance.

"For business smoothness. The production department needs to know the order level, for instance.

"For business planning.

"This is all part of a business sequence, and it's done by certain people in a certain sequence. It's a system, in other words," he said.

"A system for data processing must take precedence over all other aspects of a business, and must also meet generally accepted accounting principles," he asserted.

Most businesses need a CPA's unqualified opinion. So their systems must be designed to satisfy generally accepted accounting principles, he went on.

"The independence of the auditor is the key to 'generally accepted accounting principles,'" he declared.

The CPA's proper place in the data center is as an "interface" be-

### ***Five distinctive types of service center have emerged:***

- 1. The center that is only involved in selling unused computer time, nothing else,***
- 2. The center that sells standard computer packages,***
- 3. The center that designs and processes custom-tailored packages for its customers,***
- 4. The center serving as the hub for a time sharing service,***
- 5. The computer facilities management concept.***

tween the client and the center; the CPA can prevent the client from demanding the impossible. CPAs should get into the design phase of the system being evolved for the client, but not into actual production at the center, he continued.

The Tuesday afternoon and evening sessions were again given over to supplier presentations of software packages and services, and most of Wednesday morning was devoted to the outline of the Galion Iron Works Information System and the discussion of it that was covered in the March-April issue of *Management Adviser*.

***Our knowledge gap stems from lack of motivation, not lack of ability. Whatever we're doing now isn't taking. There are some things we definitely shouldn't do with our associates and top people. We shouldn't:***

***Preach,***

***Talk to them about making more profits,***

***Scare them to death by citing liability dangers,***

***Persuade clients to demand more computer knowledge.***

#### ***Lack of activity criticized***

The very last event of the conference was a talk, "You Have Ruined My Nice, Comfortable, Happy Life, and I Hate You All," by James Kobak, of J. K. Lasser & Co. The title may sound familiar; it is. Mr. Kobak used the same title for his concluding speech at the Fifth Annual Conference in Chicago, a year earlier. The talk this year was billed as Part II of the earlier talk and, while humorous in nature, made the same criticisms of CPA activity in the computer field that Mr. Kobak has made before.

"The amount of technical jargon per individual varies in inverse ratio to the individual's knowledge," Kobak said, referring to what he feels is a totally inadequate understanding of computers by accountants. "Nothing significant has happened among accountants for the past two years. That is true for our profession as a whole.

"Where are we really in the computer field?" he queried. "One man sitting at a console can still wreck an auditor's whole scheme of life—but most accountants don't know it. They're still arguing about 'around the computer' and 'through the computer' when we've barely scratched the field in the audit area. And that's a desperately critical area."

Many accountants still question the value of a computer; still others

are astonished to learn that EDP can be accomplished with time sharing and no heavy computer expense, he said.

Most accountants haven't invested much in computer equipment; what investment there has been has been small and isolated, he added.

#### ***Record abysmal***

Cooperation between accountants hasn't been organized as it should have been.

"We don't have a God-given right, but we do have a duty to become knowledgeable in the computer area," Kobak said. "How long are the people who need us going to wait for us?"

"Here's the most important thing that's happened in accounting, but how many top partners do you see here?" he demanded of the audience. "They must become involved just as top people in business must get involved if we're to have successful installations.

"Our knowledge gap stems from lack of motivation, not lack of ability. Whatever we're doing now isn't taking. There are some things we definitely shouldn't do with our associates and top people. We shouldn't:

***Preach,***

***Talk to them about making more profits,***

***Scare them to death by citing liability dangers,***

***Persuade clients to demand more computer knowledge."***

But there are some things that can and should be done, he advised. The approach to non-computer people should be positive; audit and tax staff should be involved, and time sharing terminals should be put on every auditor's and tax man's desk so he learns to use them and becomes part of the computer picture.

In summary, Kobak said, he had two messages he wanted to leave:

1. Don't use jargon.

2. The record of the accounting profession in computers has been abysmal. Change it.

# what people are writing about

## BOOKS

**An Executive Briefing on the Control of Computers** by LEIGHTON F. SMITH, CPA, Data Processing Management Association, Park Ridge, Illinois, 1971, 128 pages, \$9.75 (\$7.80 to DPMA members).

*Books that explain the basics of electronic data processing fall short of giving the business executive what he really needs to know—how to manage or control an EDP department and how to communicate with EDP technicians. That is*

*what this book, management-oriented rather than machine-oriented, seeks to do.*

It is no secret that business as a whole has so far failed to realize the full potential of the computer. The author of this book, who is partner-in-charge of the administrative services division of the Rochester, New York, office of Arthur Andersen & Co., thinks the basic fault is management's rather than the technicians'. It is the executive, he says, who has to specify what he wants the computer to do, and it is up to him to acquire the knowledge he needs to direct his computer personnel.

All too often, Mr. Smith says, computer installations get their start, and even continue for years, under two fallacious management assumptions: The installation's success is judged simply by whether the work gets done. If it does, management takes it for granted that the personnel who have directed the work know what they are doing and do not require extensive supervision or management review.

When something goes wrong, the usual solution is to add or replace equipment. Once installed, a computer nearly always stays because of the difficulty of retracing procedural steps. Typically, too, it

## REVIEW EDITORS

In order to assure comprehensive coverage of magazine articles dealing with management subjects, MANAGEMENT ADVISER has arranged with fifteen universities offering the Ph.D. degree in accounting to have leading magazines in the field reviewed on a continuing basis by Ph.D. candidates under the guidance of the educators listed, who serve as the review board for this department of MANAGEMENT ADVISER. Unsigned reviews have been written by members of the magazine's staff.

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grows and expands until a cost review shows that total data handling costs are increasing out of proportion to total growth. At this point the executive realizes that he has no effective way of controlling the computer technicians and that the company has become a slave to the computer. "This is the problem facing the executive, and this is why *he* must take the initiative to close the communications gap."

### **Controls spelled out**

Mr. Smith wastes no time in getting down to the practical aspects of EDP control. He doesn't bother to explain what a computer is or how it is programmed; to learn that, he advises, the executive should attend a seminar or take a course. Instead, he emphasizes that the EDP department can be controlled and evaluated by means of the standard management control techniques, and he spells out their operation in detail.

Production control, quality control, cost control, and post audit techniques are applied to the "EDP factory" and the systems effort, with generous use of illustrative forms, reports, charts, and the like. Several chapters are devoted to people problems.

### **Checklist presented**

The final chapter presents and explains an eleven-point checklist for evaluating the effectiveness of the data processing department:

Are long-range data processing plans documented? Is management involved in systems activities? Is systems project performance evaluated constantly? Are major changes in established systems infrequent? Are systems personnel business-oriented? Do data processing personnel know precisely how computer time is being consumed and how much capacity remains? Does management know how much its computer services cost? Can increased processing volumes be handled without a proportionate increase in costs? Is

data processing personnel turnover light? Are users enthusiastic about the service they receive? Is the computer used extensively as a business tool?

This sensible little book packs a lot of helpful information into a small space. Both general managers and consultants should find it useful.

**Management by Objectives** by JOHN W. HUMBLE (Editor), McGraw-Hill Book Company, New York, 1971, 294 pages, \$9.95.

*Originally a personnel technique aimed at management development, management by objectives has evolved into a whole system of management. This book, put together by a consultant who is one of the leading exponents of MBO, concentrates on a group of case studies.*

Management by objectives is defined by the editor of this book as a technique for integrating the company's profit and growth objectives with the personal goals and satisfactions of its managers.

It was proposed originally as a superior method of personnel evaluation, more concrete and psychologically sounder than older merit rating systems. The idea was that each executive should set his own specific goals for a given period, review them with his superior to make sure they meshed with company goals, and then be judged by how well he attained the objectives he himself had set. The process, however, raised many other questions—about company goal setting, about accounting and other factual performance measurements, about compensation, training, and organization structures. Now MBO has broadened into a whole management system of its own.

MBO, according to Mr. Humble, consists of seven steps:

Reviewing and restating the company's long- and short-range plans  
Clarifying with each manager

the key results and performance standards he should achieve

Working out with each manager a job improvement plan for improving the performance of his unit

Providing conditions that will facilitate attainment of the plans, particularly a clear but flexible organization structure and an effective management control information system

Using systematic performance reviews to measure and discuss progress toward results and potential reviews to identify men capable of advancement

Developing management training programs to correct managerial deficiencies

Strengthening motivation by sound selection, compensation, and succession systems.

### **Actual experience stressed**

The basics of the idea were expounded in an earlier book by Mr. Humble, a director of the British-based management consulting firm of Urwick, Orr & Partners Ltd. In this one he focuses on actual experience, via six case studies, and on problems.

Four of the case studies are by corporate or government personnel. They describe the MBO experiences of Colt Heating & Ventilation Limited; John Player & Sons, a unit of the Imperial Tobacco Group; the Royal Naval Supply and Transport Service of the British Ministry of Defence; and Viners Limited, a British tableware manufacturer. The other two, by Urwick, Orr personnel, apply the technique to two functional areas: marketing and research and development.

### **Problem areas**

The rest of the book, also made up largely of contributed articles, deals with particular problem areas: long-range planning, management development, and training of MBO advisers. Mr. Humble concludes with an action program and suggestions for further study.

Basically, as Mr. Humble himself points out, MBO is a return to the fundamentals of good management. No harm is ever done by restating these fundamentals, and this book, although at times weighed down by jargon and by intangibles, contains many good ideas.

### **Briefly listed**

**Analysis, Design and Selection of Computer Systems** by EDWARD O. JOSLIN (Editor), College Readings, Inc., P.O. Box 2323, Arlington, Virginia 22202, 1971, 387 pages, \$6.95 (paperbound).

This anthology compiles 43 current articles in two major areas of EDP, analysis and design of computer systems and equipment selection. Topics covered include feasibility studies, simulation, auditing, conversion, procurement alternatives, and contracting. One article originally appeared in *MANAGEMENT SERVICES*.

**A Primer on the Law of Deceptive Practices: A Guide for the Businessman** by EARL W. KINTNER, The Macmillan Company, New York, 1971, 593 pages, \$10.95.

A former chairman of the Federal Trade Commission explains the laws and regulations enforced by the FTC. His main focus is an attempt to categorize those practices that the FTC and the courts have found to be unfair and/or deceptive and delineate—as carefully as possible—the law with respect to each, with attention to discrepancies among state laws or among different commentators and to ad hoc standards for judging new advertising techniques. Consumer protection and credit regulation are also examined.

**Handbook of Modern Marketing** by VICTOR B. BUELL (Editor-in-Chief) and CARL HEYEL (Coordinating Editor), McGraw-Hill Book Company, New York, 1970, 1,468 pages plus index, \$27.50.

This book, made up of 120 chapters by more than 100 contributors, aims to cover every subject likely to be encountered by marketing executives. These include the identification and classification of markets, product line planning, distribution, pricing, marketing research, planning the marketing program, organization and staffing, control, marketing management, the marketing mix, selling and sales management, market communications, customer services, financing marketing operations, packaging, the legal aspects of marketing, the application of management sciences to marketing, specialty marketing, and international marketing.

**Computer Simulation of Competitive Market Response** by ARNOLD E. AMSTUTZ, The M. I. T. Press, Cambridge, Massachusetts, 457 pages, 1970, \$17.95 (cloth-bound), \$4.95 (paperbound).

This ambitious book outlines a comprehensive behavioral theory of market interactions and presents explicit models of each of the major components—the manufacturer, consumer, retailer, distributor, salesman, even government. The overall model described is one used in teaching marketing management at M.I.T.'s Sloan School of Management. There also are suggestions for companies that may wish to simulate their own markets.

**Interview! The Executive's Guide to Selecting the Right Personnel** by THEODORE HARITON, Hastings House, Publishers, Inc., New York, 1970, 159 pages, \$6.95.

A guide to employment interviewing for the executive rather than the personnel specialist, this book by a personnel consultant reviews basic principles, techniques, and styles of interviewing and their application and explains how to analyze and judge personality, intelligence, background, and capabilities; how to explore the whole pic-

ture of an individual's life; and how to relate the applicant's past to the position for which he is being considered.

**Helpful Hints on Managing Your Money for Retirement** by WILLIAM LASS, Popular Library Inc., New York, 1970, 159 pages, \$9.95 (paperbound), available without charge from a number of savings and loan associations that are members of the Savings and Loan Foundation.

Topics covered include housing, Medicare and Medicaid, Social Security benefits, annuities, pensions, savings accounts, portfolio management, inflation, cost-cutting shopping techniques, and choice of a second career.

### **MAGAZINES**

**Are You Overlooking a Cool Million in Your Factory?** by DAVID A. UMSTEAD, *Business Management*, December, 1970.

*Production scheduling techniques can sharply increase efficiency in the use of production input variables, thereby increasing productive capacity and profits. This author describes one method for establishing a computerized factory loading system, as developed within his company.*

The preliminary assumptions which Mr. Umstead makes are these: (1) The product work mix is diverse enough to provide planning flexibility, and (2) the plant management is sophisticated enough to provide the necessary input and effective enough to utilize the system's output. The system is designed to be operated by the production scheduler on time sharing facilities. "Used in conjunction with forecasts and orders, it becomes a tool with which the scheduler can make more timely, accurate loading decisions."

In the conventional situation, the author points out, production



scheduling is done by an arbitrary allocation of sales orders, issued to the production foreman without recourse or alternative. The results of this method are bottlenecks in production, cumbersome in-process inventory, and erratic labor utilization.

### **Basic problems**

The basic problems faced by production schedulers are to determine the available production inputs and the resources' requirements related to each output unit. The scheduler must then select a combination of orders which will "(a) maximize production, (b) provide a balanced work load for a smoothly flowing production line, and (c) meet all commitments." These decisions are made, and a daily production schedule is prepared.

The system which the author describes was designed to determine the best possible work mix to enter the factory each day, using a combination of linear programming and a heuristic technique. The heuristic technique involves an algorithm which rapidly arrives at a solution which is close to the optimal. The suboptimal heuristic solution is then used as the starting point for a linear program, thereby avoiding the numerous iterations of the pure linear program model. As the author points out, "linear programming is a mathematical technique developed to maximize linear expressions subject to numerous inequality constraints." These linear expressions, containing the production constraints, are arranged in matrix form, and the standard simplex method is used to arrive at the optimal solution. This method also has the advantage of assigning priorities to the production mix.

### **Example given**

The author gives an operational example of the system in use at a weekly production meeting. The week's sales orders are presented to the production manager, who then forecasts the needed resources, compares these with the resources

available, and points out impossibilities or potential problem areas. The needed changes are discussed and agreed upon. These decisions are incorporated in the model, and a daily production schedule is prepared.

An actual case illustrated in the magazine, involving J. F. McElwain, a division of Melville Shoe Corporation, shows that this factory loading system resulted in smoothing of daily production quantities and a higher average level of production. The other benefits included reduced processing time, lower inventory, more efficient labor utilization, and a higher predictability of completion dates.

STEVEN FLORY

*Louisiana State University  
at Baton Rouge*

### **Evaluating and Planning the Corporate Financial Structure** by HARRY LEVY, *The Australian Accountant*, June, 1970.

*This article outlines one way to approach the evaluation and planning of the financial structure of a going concern.*

The planning process and the determination of corporate objectives, Mr. Levy points out in this article, will necessarily place financial objectives in the forefront of the aims to which management must direct its effort. Complementary to the establishment of profit targets will be the determination of goals relative to the financial structure of the enterprise. The attainment of financial stability, flexibility, and liquidity for the organization thus provides a basic challenge to the financial executive on the planning team.

The overall planning process, the author asserts, should orient all activity toward the established profit objectives of the corporation and, in recognition of the need to plan and control the company's financial condition, should provide an optimum standard for compar-

ative purposes. He illustrates here a course of positive action that may be followed by the financial executive to control the financial balance of a business unit, including the steps to be taken in establishing the planning strategy for an improved financial position.

### **Evaluating financial position**

To evaluate the financial position of a corporation, the author suggests here a threefold approach: Examine the basic financial characteristics of the corporation in terms of (1) industry in general on a national scale, (2) the particular segment of industry in which the corporation operates, and (3) the corporation itself. Conventionally, the balance sheet has been regarded as a funds statement demonstrating the sources and use of resources. However, the author feels, the emphasis which the planning of corporate financial structure necessarily places on liquidity suggests that the "assets" side of a balance sheet should be viewed as an indicator of the manner in which the economic resources have been deployed in order to attain the basic corporate objectives. At the same time, the liabilities shown in the balance sheet may be viewed as the sources from which the funds so utilized have been obtained.

### **The key ratios**

The author lists eight ratios as the key criteria in financial evaluation. Three of these are balance sheet ratios: ratio of stockholders' equity to total equity, ratio of fixed assets to total assets, and current ratio (ratio of current assets to current liabilities). The income statement ratio he considers significant is the ratio of net income before taxes to sales. The four remaining ratios are cross-statement ratios: total inventories to average monthly cost of goods sold, accounts receivable to average monthly sales, yearly sales to total assets employed, and net income before tax

to total average assets employed.

The author feels that evaluation of corporate financial position should consist of examination of these ratios for the corporation in relation to the corresponding ratios prevailing in industry as a whole and in the particular segment of industry in which the corporation operates. On the basis of this comparative examination, practical and realizable norms may be set for the company as an element of strategic planning, and a target financial profile can be derived. The author analyzes each of these ratios and its implications for the financial structure.

Financial planning demands that activity be undertaken in the present to ensure that a sound financial condition be maintained or, if it does not exist, be produced. The author sees survival of the business unit as a function of its capacity to continue to earn an acceptable level of profit; this capacity will be found to depend on the creation and maintenance of a soundly based and well balanced financial structure.

NATWAR GANDHI

*Louisiana State University  
at Baton Rouge*

**Some Observations on the New Management for College and University** by DANIEL D. ROBINSON, *Management Controls*, October, 1970.

*The current financial crisis in American higher education might be alleviated, this author suggests, if universities made more use of the management techniques that have proved so successful in business. He has some specific recommendations to offer.*

Many universities already face and many more are rapidly approaching severe financial crises, partly as a result of shortsighted administration. Demands on universities from both within and without are expanding rapidly; costs

are increasing even more rapidly; and there is growing disagreement over existing programs. All this has brought an ever-widening degree of complexity to the decisions universities have to make; they must learn to operate within the framework of constrained choice.

Successful operation will be possible, Mr. Robinson notes, only if universities apply some of the management techniques already used in business and government. Such techniques are most urgently required to improve organizational structure, planning, budgeting and control, operating systems, and management information systems (MIS).

### **Organizational structure**

Most universities have only minimal formal organizational structures. To manage effectively, however, university administrators must be aware of individual responsibilities and authority. An organizational chart is helpful in spelling out these limits and also in providing information on how each person or function is expected to relate to all others in the total organization. Several universities have found that the department chairman, because of his association with both faculty and students, emerges as a central figure in the management process. But, the author notes, chairmen are seldom selected or rewarded for their administrative ability. This situation should be remedied; chairmen should be given the training and support necessary to facilitate the successful assumption of their responsibilities.

### **Planning, budgeting, control**

All parts of a university must have congruent long-range goals, especially long-range academic goals. In the absence of clear-cut goals, universities too often have established programs in many diverse areas instead of concentrating on doing fewer things well. Additionally, long-range planning en-

courages universities to quantify their goals, assess the impact of decisions on their resources, and consistently monitor the ongoing results of operations. Simulation models are an effective aid in this area.

Currently, the need for effective budgetary procedures is perhaps even more critical than the need for planning. Unfortunately, the typical approach accepts historical expenditures as given and assumes that the current budget should exceed the prior budget by some arbitrary amount; rarely are requirements related to the output of each activity being financed. If costs are related to output, a meaningful criterion is provided for evaluating current and proposed programs in the light of long-range academic objectives. Sufficient lead time should be provided in budget preparation so that all fundamental issues can be properly considered and resolved.

The budget will be an effective operating tool only if each individual is held responsible for the resources and output relating to the activity under his control. In turn, responsibility accounting is facilitated by the existence of an organization chart and by the aforementioned budgetary procedures.

### **Operating systems**

Operating systems in the university include admissions, scheduling, registration, purchasing, payroll, and cash management, among others. Several universities have been successful in adopting some of the individual operating systems in use at other universities. Attention should be given to the interdependence of operating systems to ensure that new ones are compatible with existing systems that continue to be used.

### **MIS**

Management information systems (MIS) are viewed as the link between the planning-budgeting-operating-control functions of manage-

ment and the operating systems through which activities are accomplished. Only recently have universities realized that an MIS may facilitate decision making. A university MIS should provide for the capture, storage, classification, and retrieval of information in a manner that will facilitate the management function. The MIS may be computerized for large universities. Better classification within existing non-computerized systems and wider dissemination of existing information may suffice for small colleges.

Mr. Robinson emphasizes that universities are economic entities and hence should act rationally to avoid financial crisis. Application of proven management techniques will aid universities in operating effectively under constrained choice.

CORWIN GRUBE  
*Michigan State University*

**What Should "Cost" Mean** by  
ROBERT N. ANTHONY, *Harvard Business Review*, May-June, 1970.

*A recent report by the Comptroller General of the United States accepted the feasibility of developing cost concepts and standards, and the issue was placed before Congress. The need, especially for contractual arrangements in which cost of materials or services is a factor, is great, and the time, this author feels, is now.*

The author of this article maintains that the time is ripe for ending the general confusion over what "cost" means in business situations. "Cost," he says, has no generally accepted meaning; two manufacturers producing physically identical widgets but using different, although acceptable, methods of measuring cost could differ in their reported costs of making widgets by 100 per cent or more.

The definition of cost is particularly important in contractual arrangements where costs of mate-

rials or services are factors. In posing a representative "negotiation" problem for this article, the author deliberately limits the problem to reimbursable costs.

### ***Conceptual framework needed***

The Accounting Principles Board, Professor Anthony feels, has erred in the past by formulating standards for specific types of costs without first providing a conceptual underpinning in the form of a statement of broad principles. Such a conceptual framework, he says, should spell out, in broad terms, the answers to two questions: What are the total costs incurred by an organization in an accounting period? How should these costs be divided among the several cost objectives (i.e., contracts) of that period? The author sets forth what he feels to be the principal considerations to be taken into account in answering these questions.

Professor Anthony devotes a good deal of space to the issue of which organization should be responsible for developing the concepts and cost standards. The organization, he says, must be a continuing one; it must be authoritative; and it must be able to attract competent people. Since the job will be expensive, it must be capable of raising substantial sums of money. The APB (which, indeed, is now engaged in another effort to decide on broad accounting concepts) meets these requirements. However, it works slowly and is subject to many pressures and to dilatory tactics on the part of many groups. Other leading private organizations have no way to ensure compliance with their pronouncements.

### ***Government action likely***

Hence, Professor Anthony thinks it unlikely that a voluntary effort by the private sector will succeed. If Congress acts on the question, he feels, it undoubtedly will require that any private organization

picked to set standards, in addition, to being authoritative, permanent, and well financed, be representative of the interests of both government and business and have safeguards against dilatory tactics. There is no such private organization, he says, concluding that Congress is more likely to entrust the task to an organization set up within the framework of the Federal Government.

Congress could direct the Comptroller General to undertake the task, or it could create an independent body. Each alternative has advantages, and the author spells out some of them.

Inaction, he warns, could be highly disadvantageous to business. If Congress is persuaded to take no action and if only a half-hearted voluntary effort is made, the problem will make headlines again in a few years. Then, says Professor Anthony, we will almost certainly see a unilateral Government effort with only insignificant participation by business.

Professor Anthony has long been concerned with problems of cost as a teacher, government executive, consultant, and member of professional groups. He has written a thought-provoking article about a vexing problem that is worth the attention of all accountants.

ROBERT M. BRAUN  
*New York University*

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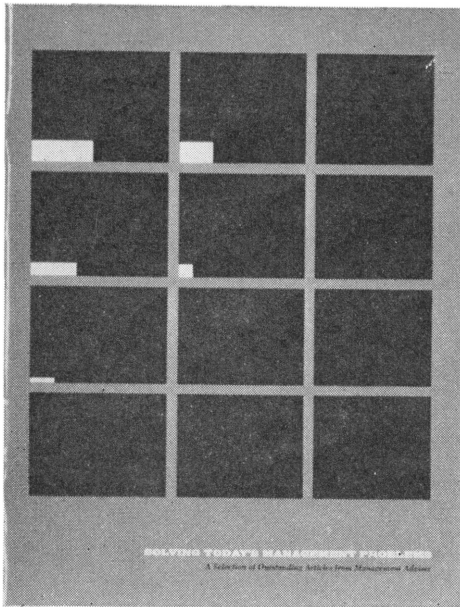
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